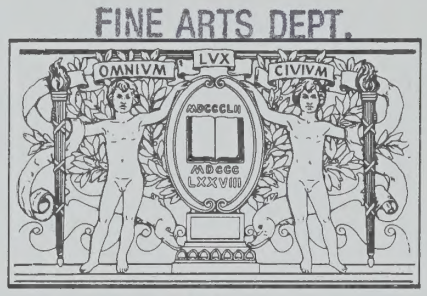

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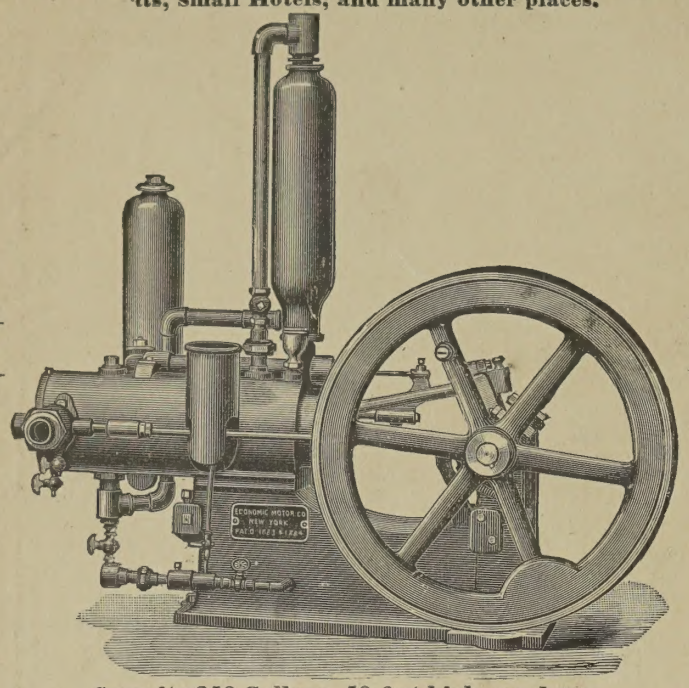

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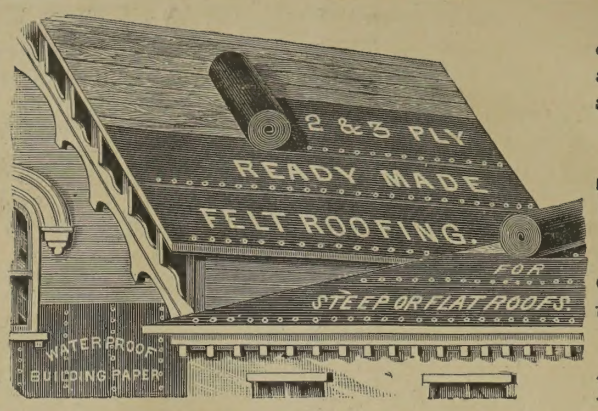

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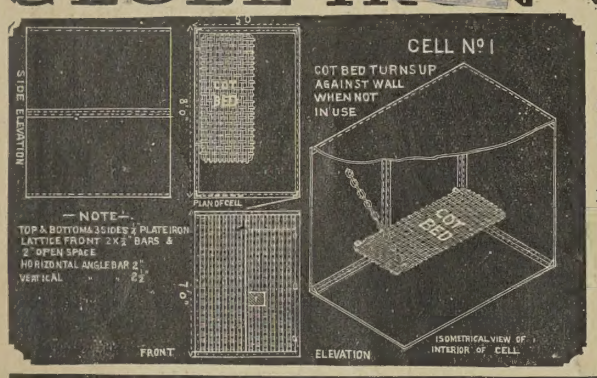

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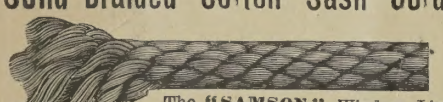

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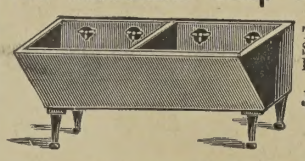

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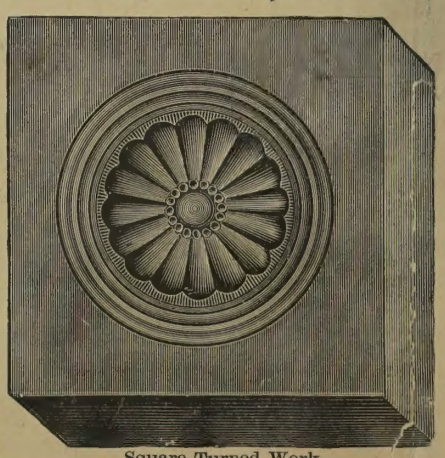

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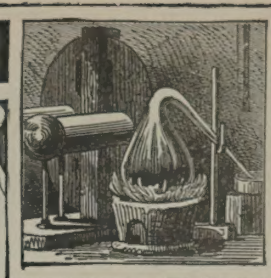

SCIENTIFIC AMERICAN

ARCHITECTS AND BUILDERS EDITION.

Vol. III.

JANUARY—JUNE,

1887.

MUNN & CO., PUBLISHERS,

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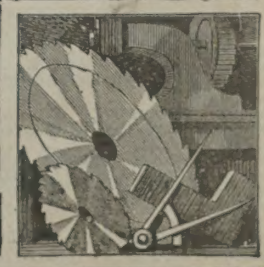

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II. Farragut Club House, Chicago; with details of construction. A $1,600 cottage; with plans and details of construction. February.
III. One story dwelling with detached kitchen; with plans and details of construction. A $2,600 cottage; with plans and details of construction. March.
IV. A cottage of moderate cost; with plans and details of construction. Residence of F. W. Coolbaugh, East Orange, N. J.; with plans and details of construction. April.
V. The cottage (as shown in April number) as enlarged; with plans and details of construction. A dwelling at Orange, N. J.; with plans and details of construction. May.
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SCIENTIFIC AMERICAN

Entered at the Post Office of New York as Second Class Matter.

ARCHITECTS AND BUILDERS EDITION.

Vol. III. Subscription, $1.50 a Year. NEW YORK, JANUARY, 1887. Single Copies, 15 Cents. No. 1.

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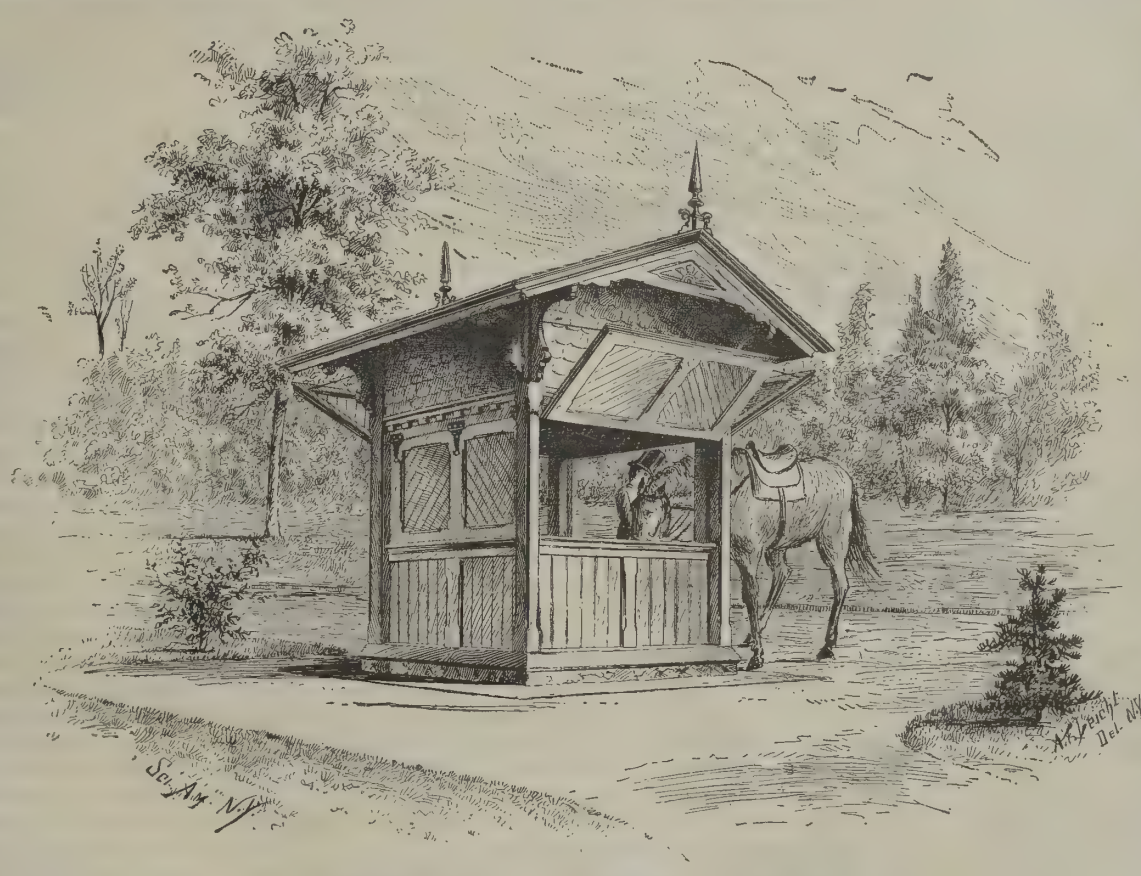
Designed for J. B. Dutcher, Esq., Pawling, N. Y., by B. J. Schweitzer, architect, Lawrence Building, 84 West Broadway, New York.

The structure is so arranged and fitted up with doors that, by the exercise of a little care, the tank and pipes can be kept from freezing in the coldest weather. The doors, opening upward and operated by weights and pulleys, act as an awning and shade, thus aiding and keeping the water cool in warm weather. This makes it a suitable, profitable, and attractive invention for parties who keep cattle and horses. The tank and all pipe fittings were put in by Mr. A. J. Corcoran, of 76 John St., New York, and are connected with his improved windmills and system of waterworks.

Drawings by Mail.

One of the matters which we hope will engage the attention of the Convention of the American Institute of Architects is the provision of better and cheaper facilities for the conveyance of drawings by mail. At present, by a ruling of the Postmaster-General, drawings and tracings must pay letter postage; and where drawings are sent in pasteboard cylinders, or on wooden rolls, as is absolutely necessary to preserve them from the rough handling of the letter carriers in cities, the cost of forwarding them by mail, although only one-half of what it was in 1885, is still very considerable, especially as compared with that of sending parcels of merchandise or printed matter; and architects are in consequence usually obliged to intrust their plans to the express companies, which, in country towns, are apt to be slow and uncertain in delivery. Even where an architect, for the sake of having his drawings transmitted through the most direct and recognized channel, goes to the expense of sending them by mail, he is, under the present system, by no means sure that they will arrive safely, and he has no redress against the Government in case of their loss or destruction. Most of us have had repeated experience of the loss of plans in the mails, and we remember one occurrence, more annoying, if possible, than the total loss of such property, where a city letter carrier, to save himself the trouble of taking upstairs a valuable plan, which, unfortunately, had not been rolled on a cylinder, deliberately crumpled it up and pounded it until he could force it through a half inch slit into a little letter-box in the hallway of the building where he was to deliver it, and there it was discovered, some weeks later, after a great deal of time had been spent in trying to find what had become of it. Our post office system is none too good, in any case, but we rarely hear of losses of merchants' samples, or other things of the kind, which pay for transportation only a small fraction of the tax levied on architects' drawings; and so long as architects pay exorbitant rates for such service, they are certainly entitled to demand that it should be done with decent care and dispatch. The fact is that in the whole matter of transmission of parcels our post office is at least twenty years behind that of any other civilized country. In England, France, or Germany it is now as common to take a box or parcel to the post office for forwarding as it is with us to mail a letter. Anything, not dangerous to other property carried with it, is accepted, prepaid by stamps at what seems to us an absurdly low rate, and sent by the next mail, and delivered to the consignee. There is a limit to the size of the parcels received, but in England anything can be sent, we believe, which does not exceed seventy pounds in weight, or which does not measure, by adding the length to the girth, more than six feet. As these limitations admit a trunk of tolerable size, nearly all the transportation for private individuals which with us is done by the express companies, inconveniently and expensively, is there carried on by mail, and the service is so efficient and profitable, even at the low rates charged, that the various European countries are at this moment actively engaged in arranging for the extension of the "parcel post" to include service from one country to another. Here, as each nation has its own custom house regulations, it is necessary to provide for examination at the frontier and for the collection of the duties, but this has been successfully arranged, and the international parcel post is already in operation between England and Belgium, and will, according to the official announcement made last summer, be very soon extended to Germany and Holland, if it has not been already established. Between England and her colonies packages of merchandise have been transmitted by mail for some months, at rates which must make Americans who do not own stock in express companies rather envious. The last parcel which came to us across the ocean was a box, about fourteen inches cube, containing some books, and the bill for transportation from Liverpool was about five dollars. The same parcel, if we understood correctly the tariff of rates of the colonial parcel post, which we saw in various places in England, would be carried from any post office in England to any post office in New Zealand, and delivered to the consignee, for thirty cents. Now, New Zealand is exactly on the opposite side of the earth from London, and the distance, by the shortest mail route, is about fourteen thousand miles; and if the English mail steamers are glad to carry such a box fourteen thousand miles for thirty cents, it would seem as if a charge of five dollars for conveying a similar box, in the same steamer, less than one-fourth of the distance, must allow, to say the least, a considerable margin of profit. In a less degree the same discrepancy in cost between having a thing done on a great scale for the public benefit and on a small scale for private profit is to be observed in inland transportation, and it is quite time that the people in this country, out of whose pockets comes the difference, should have the benefit of such economies as are now in operation elsewhere. Although architects do not have to pay out a very large portion of their substance for the carriage of their plans, their express and postage bills generally amount to a very respectable sum by the end of each year; and as they have the advantage of being able to speak their minds through the deliberations of a highly respected organization, representing all portions of the country, whatever they might say on the subject would be sure to command attention.—*Amer. Architect.*



DESIGN FOR A DRINKING FOUNTAIN.

Asphaltum Pavement.

The best pavement in Philadelphia is the asphaltum pavement around the City Hall. It was laid in September, 1884, cost no more than Belgian blocks, and is as perfect as when put down. It is as noiseless as a macadamized road, smoother than the smoothest floor, and affords an excellent surface for horses' feet. It is easy to clean, handsome, impenetrable to water, and resists the torrid zone of August and the lowest winter temperature perfectly. It requires hardly any repairs, and does away with the necessity for "crossing stones," as it is itself equal to any sidewalk. It is vastly better than a cobblestone pavement, which allows mud to ooze up with every rain, grass to grow in all the crevices, and requires constant repairs on account of settling. It surpasses Belgian blocks, for they are noisy, hard upon vehicles and horses in winter and summer, and are not easy for foot travel. None of the other alleged improved pavements, like the wooden pavements of Chicago, the hard firebrick pavements of Steubenville, or the "composition" pavements in vogue in some of the smaller New England cities, possesses the excellent properties of this asphaltum pavement about the City Hall, and it was not laid under the most favorable conditions. As it has answered so well where it is, it should be tried on other streets. Let it be further tested at points of heavy travel in the business portions of the city. While it would not be advisable to take the results up to this time, satisfactory as they are, as conclusive, they certainly warrant the expenditure of money in thoroughly determining upon the value of a street pavement that seems the best now in use in Philadelphia.—*Philadelphia Daily News.*

Gluing.

Experienced woodworkers have always contended that a glue joint, properly done, is stronger than the wood itself. And yet joints often give way at the surface where the glue is used, which is accounted for by bad material. A similar reason is frequently the true cause, which few artisans wish to acknowledge. It is merely that skill is lacking. In gluing wood, it is asserted by competent authority that bad work is produced by applying glue to both surfaces. A good job is secured by applying the glue hot, but not extremely so, to one surface, which should be cold, while the other surface should be heated at the stove, but should have no glue upon it. By this method the glue will permeate the wood, and bind the surfaces together firmer than nature binds the fibers. It is said by good cabinetmakers that if these precautions are taken, less difficulty will be found with glues which, skillfully handled, usually will do the work required of them.

AMERICAN PAINT.—There are now sold in the United States about $250,000,000 worth of paints every year, and raw materials to the amount of half this sum are consumed in making them. Putty is made by all the big paint factories. It is made out of whiting and the skin of linseed oil. It is put up by the thousands of tons in kegs and skins, and costs about a cent and a half a pound to make it.

Scientific American.

ESTABLISHED 1845.

MUNN & Co., Editors and Proprietors,

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

NEW YORK, JANUARY, 1887.

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THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

The twentieth annual convention of the American Institute of Architects was opened on Dec. 1, in this city, by the president, Thomas U. Walter, of Philadelphia. He defined architecture as a science in which the good, the true, and the beautiful predominated in all its relations, and regarded the philosophy of taste as indispensable to a successful practice of the profession. Social and fraternal relations were to be promoted, on the ground that knowledge of each other would engender respect and create a truer feeling for art.

He believed that the ennobling and elevating character of an architect's profession should carry him above all petty rivalries and animosities. Confessedly not doing so, the results must be ascribed to the inherent weakness of all human endeavors.

The evidences of progress in the growth of taste and the improvement observable in the general character of buildings erected during the current year, or which are in process of erection, were briefly noted.

Great changes have taken place in the ornamental character of brick and stone work, chiefly the former, and these changes had imparted to modest as well as pretentious buildings, an unmistakable element of taste and refinement. The widespread satisfaction at this state of things is an omen of promise.

The home building instinct of the American people, which fortunately is not a race impulse, has spread its protecting and ennobling influence over the land, and is animated with that insatiable vigor which marks this nation as exceptional.

Wherever terra cotta decorations in brickwork have been tastefully and harmoniously applied, they have imparted an artistic effect. Like many other meritorious accessories, however, its usefulness has been impaired by its abuse.

The popular idea that comfort, convenience, good taste in design, and carefully studied construction are synonymous with costliness is due solely and wholly to an insufficient knowledge of the subject. The tendency of the day is to cheapen construction by every legitimate appliance and device. The apparent cost of a patented invention is more to be found in the name than in the reality. The desire to obtain a ten thousand dollar house for eight thousand dollars is a proverbial weakness of the human race, but the difficulty is to secure from the individual the admission that he himself shares this weakness. The distress that this want of frankness causes is too well known to be discussed.

The fact remains evident that many a plain and unpretentious house shares equally with its palatial namesake the every comfort and refinement of a home.

The growth of taste is admitted. The Queen Anne prettiness is acknowledged to be pretty, but it lacks character and a reason for being what it is, and it is passing away like a fashionable folly. The unrivaled richness of the French Renaissance is confessedly too ornate for our simpler tastes. It smacks of the wanton luxury of French courts, and it has about as much sincerity as an appanage of the court of Louis XIV. Its use is now confined to interiors, where it may in all candor remain, a true expression of the artistic thought of a by-gone day of splendor and excess.

We would catch the spirit, the immortal grace, of every style and period, but we shall accomplish more by endeavoring to utter the principles of their being than by trying to adapt their mere outline of forms and pomp of circumstances to our widely different and variable conditions.

It is observed with pleasure by all true art lovers that the effete forms and constructions of by-gone ages are passing away. The traditions of the past remain with us to guide us in our endeavors.

Because of the conditions which gave it birth and ally it more closely to our time than to that of any other epoch, the resources of mediæval art are being studied with an eagerness and a scientific spirit belonging to the art itself that are commendable wherever the name of art is revered.

The great distances which separate the art centers of the country are gradually being drawn together by means of auxiliary architectural societies, sketching clubs, and annual exhibitions.

The United States now contains thirteen distinct architectural associations, connected in one way or another with the parent organization.

The improvement in the advancement of architectural art and the sciences related to it is due largely to the united work of these organizations.

The Institute is steadily growing in numbers and influence, and constant applications are received from men of prominence in the profession to join its ranks. It now consists of 191 professional members, of which 97 are fellows and 94 associates.

The objects of the association are to unite in fellowship the architects of this continent, and to combine their efforts so as to promote the artistic, scientific, and practical efficiency of the profession.

The questions naturally arise, How are they promoting the efficiency of the profession? and In what manner are they administering to the public good?

It is the policy of the Institute to establish chapters, or auxiliary organizations, in all of the leading cities, or wherever the number of members will warrant their establishment. In Philadelphia for instance, social meetings are held monthly at the residence of some member, ideas are exchanged on all cognate topics, and the good of the profession is practically and artistically promoted.

One of the most powerful influences for the public good is manifested through the work of the committee on education. The first college in the country to establish a course of study in architecture was the Institute of Technology, at Boston, followed by Cornell University, at Ithaca, N. Y., and the School of Mines of this city. Western colleges are instituting similar courses, and the means for acquiring a good foundation for an architectural career are on a substantial basis.

In this connection it is well to mention the work which the people through their own agent, the Bureau of Education, at Washington, are doing for themselves. A series of pamphlets, called "Circulars of Information," are published for distribution among teachers, physicians, engineers, architects, and to all who are interested in the cause of education. Their matter relates largely to the art and science of school building, planning, hygiene, and management. They are written by specialists eminent in their field, and indeed some of these men, in the unassuming pamphlets, have recorded the highly valuable work of a life-long research on these lines of study.

The vast improvement everywhere noticeable in the character of our school buildings must be attributed, to some extent, to the information contained in these circulars.

(To be continued.)

HOW NOT TO DO IT

Seems to be the aim of many architects and builders of the present day. Formerly, houses were built in a thorough manner, with heavy timbers, closely fitted together with mortise and tenon and strongly braced, so that when completed the building was substantial and durable. How different in these respects are the houses which are now being constructed all about us! A partial description of one now being built near the writer's residence will suffice for an illustration. It was begun under contract to be finished and ready for occupancy November 10. Its cost to be $3,560. The foundation wall, instead of resting upon a bed of concrete twelve inches thick, below the level of the cellar bottom, is placed at once upon the ground laid up in a hurried manner without cement, and without any filling up of the interstices between the stones with mortar. Upon this poorly constructed foundation are placed 2×10 timbers for the sills, laid down on the flat, the ends of which are notched out to the thickness of one inch, and then nailed together. Upon this flimsy base the uprights are placed, none of them being larger than 2×4, except the corners, which are 3×6. The horizontal pieces are two, 2×4, nailed together, and this, too, over windows and doors, where considerable weight will have to be sustained. This same lightness of material is seen throughout the entire frame and rafters. These are fastened together with the least possible number of nails. In this way several thousand feet of timber and many days' labor are saved to the contractor. This frail frame is, of course, much strengthened by the sheathing boards which follow, but even these are often put on *horizontally*, instead of *diagonally*, as the latter method takes more time and material. The floor beams are bridged in the flimsiest manner, the contractor relying for the bracing upon the flooring boards laid upon them. The same principle of "how not to do it" thoroughly is carried through the entire structure as to the mason work, the plumbing, and the tin work—especially in the last two—so that the house, when done and ready for occupancy, will be after all a mere shell, to shake in every wind, to leak in every rain storm, and to freeze its unfortunate occupant in all cold weather. It will doubtless, to the casual observer and, perhaps, to the coming tenant, look well, inviting, and to all appearances as good as any other better built house. One year's occupancy, however, will dispel all delusions, and show to the owner that it is but a sham, and he will be appalled at the prospect before him of necessary repairs. His investment will be found unprofitable, and perhaps his tenant leave the premises in disgust at country built houses in general. The pertinent question now is, How does this state of things come about? It happens in this wise: The owner desires to invest a certain amount of money, and tells his architect that this is his limit, and that it must not be exceeded, and yet for this sum he must have a house with an attractive exterior and a given number of rooms of goodly size. The architect endeavors to comply, and, so that his task may not be impossible, he draws the specifications so that a contractor may be found who will undertake the construction of the building for the price named by the owner. He, in his turn, to get out whole under existing diffi-

culties with skilled labor, the high wages, and short hours, studies most diligently *how not* to put in anything, either of time or material, that can be omitted. A watchful contractor has always the advantage over the owner, who probably is trustful and possibly often absent. Thus it will be seen that owner, architect, and contractor are each and all responsible for the effort of "how not to do it" as it ought to be done. The first, in not recognizing the principle that a good article cannot be had without corresponding cost; the second, for complying with the unreasonable demand made upon him, and which he knows will result in the end with only dissatisfaction to all concerned; and the last, for willingly undertaking a work of such importance to health and moneyed interest as the building of a house, when he knows he must scimp everywhere, to the verge of dishonesty, in order to save himself from loss. The *result* is that everywhere about us are seen these flimsy, poorly constructed houses alike detrimental to the profit of the owners' ents and the comfort of the occupants. A well cted house, even if it does cost more at the oves always the better investment, for the ex- is more than saved in the absence of future to which, in a house badly built, there is

AN EIGHTEEN HUNDRED DOLLAR COTTAGE.

The following relates to the cottage illustrated in our colored plate given in our last (December) number:

The design is an excellent example of the possibilities developed by the prevailing demand for cheap and, at the same time, convenient and attractive cottages. This building can be erected and fully finished complete at a total cost of $1,800, and the accommodations will be found to compare favorably with many houses of a much greater cost. The rooms are all of ample size and of convenient access and communication. Ample provision is made for closet accommodations, etc., and a cellar extends under the entire building.

The construction may be briefly summed up as follows:

The cellar and foundation walls are to be built up with good building stone, laid in lime and cement mortar. The frame is to be constructed with good hemlock timber, of the following dimensions, viz.: Sills, posts, plates, and girts, 4 in. x 6 in. First and second tiers of floor joists, 2 in. x 10 in., 16 in. on centers; attic joists, 2 in. x 8 in., 16 in. on centers. Door and window studs, 3 in. x 4 in.; partition studs and nailing joists, 2 in. x 4 in. and 3 in. x 4 in., 16 in. on centers. Rafters, 2 in. x 6 in., 2 ft. on centers.

The frame is to be sheathed with millworked hemlock boards, which are to be covered with best sheathing felt, and the exterior finished with shingles and siding, as shown. The roofs are to be sheathed with shingling strips, and covered with best No. 1 pine sawed shingles.

The interior finish is to be neat and simple. The floors are of millworked white pine of medium width. The walls are hard finished. The doors, hardware, etc., are first-class throughout.

The alternative exterior, given in elevation on the supplementary sheet given in December, can be carried out for about $1,200.

Horace G. Knapp & Co., architects, of 176 Broadway, New York city, are the authors of the design.

ST. JAMES' RECTORY, FORDHAM, N. Y.

About two years ago, the rectory attached to St. James' Church at Fordham, N. Y., was erected for the Rev. C. J. Holt, from the designs of the eminent architect, Edward A. Sargent, Esq., of No. 55 Broadway, N. Y. city. We give with this number a colored plate and a sheet of very useful details of this handsome residence.

Examined either from the standpoint of an architectural production or from that of the more practical view of the occupier, the design cannot be considered to be otherwise than a very satisfactory one. The artistic treatment of the details and the happy choice in colors make the whole effect very pleasing.

Stone of a light brown tint has been used for the lower portions of the walls, and in the positions marked in black upon the plan in colored plate. The chimneys are built of pressed brick, and the upper portion of the building is shingles and clapboards. The roof is shingled, and terra cotta panels are used in places.

In the plan of the house we have a somewhat unusual arrangement, in the manner of placing the kitchen and servants' apartments. By building them at an angle, they are kept distinct from the remainder of the house, entirely doing away with the noise and smell inseparable from the use of a kitchen. At the same time, the close proximity of the dining room renders the arrangement a good one for serving. On the ground this manner of planning appears by no means awkward, but rather tends to increase the apparent size of the house.

There is a fine hall and open staircase, finished in polished oak, and a large oriel window on the second floor, forming a balcony and being richly ornamented with cathedral glass. The details of this window are shown in our supplementary sheet.

A very pleasing feature in the house is the number of comfortable corners provided. Thus, in the dining room we have a corner seven feet by nine feet, inclosing the fireplace and forming a very cozy position. In the library is another snug corner in the bay. Stained glass is used for the transom lights in many of the rooms, with excellent effect.

In the parlor, library, dining room, and hall are open fireplaces with tile hearths, tiled mantels, and bright brass borders, fenders, and dogs. Over-mantels of special design are provided, that in the parlor being constructed of cherry and those in the other rooms of polished oak. Each is fitted with beveled edge mirrors and stained glass ornamental work.

The hall and dining room are finished with ceilings of hardwood, paneled and ribbed, and the floor of the latter is laid diagonally in narrow widths around the border. The ceilings of the other rooms are plastered and have deep cornices. The doors, bases, and trim generally are of pine, stained a light color, and varnished in the main rooms and oiled in the upper floors.

Electric bells hot and cold water, and gas are laid throughout the house. The kitchen is fitted with Barstow's "Improved" range.

The cost of the house in its present condition was about $11,000.

A DWELLING OF MODERATE COST AT RUTHERFORD, N. J.

The perspective drawing and plans shown on the colored plate presented with our present issue, and the accompanying sheet of details of construction, form, with the specification below, a complete set as prepared by Mr. B. J. Schweitzer, architect, of No. 84 West Broadway, New York city, for the erection of a two story dwelling at Rutherford, N. J., for Mr. A. F. Garnier.

The design has been carefully considered with the view of providing a comfortable and convenient house at a moderate cost. The whole arrangement is a successful one in the cozy and snug appearance it presents and the attractive and appropriate elevation provided.

While keeping the cost strictly within moderate limits, the architect has employed only the best materials and construction, as will be apparent on reference to the specification.

The sheathing is of dressed hemlock boards, and is put on diagonally, and the roof is covered in with Bangor slates of a dark color, producing a very good effect.

Mr. Schweitzer has had a very extended experience in designing all descriptions of houses. In Rutherford, N. J., alone he is responsible for over a hundred buildings, while at Passaic and various other places on the Erie he is well represented by his characteristic work. His fifteen years' labor in New York and its vicinity has made him well known as a careful architect of originality and assiduity.

SPECIFICATION.

EXCAVATIONS.

Cellar.—To be under the whole house, 3 ft. 6 in. deep.

Cesspool.—To be 7 ft. in diameter and 8 ft. deep, built where directed.

Cistern.—To be 8 ft. in diameter and 10 ft. deep, built where directed.

Trenches.—For pipes to be at least 2 ft. 6 in. below the surface.

Piers.—All outside piers to be at least 2 ft. 6 in. below the surface. All inside piers 6 to 8 in. below the cellar bottom.

Privy Vault.—To be 4 ft. 6 in. long, 4 ft. 6 in. wide, and 4 ft. deep, built where directed.

Grading.—Clean up the entire premises of all rubbish, and grade off earth around the house as directed.

MASON'S WORK.

Cellar Walls.—Up to the surface level, to be 18 in. thick, of Belleville quarry stone, laid in good lime and cement mortar. All to be bonded and pointed complete. Above the ground build a hard brick wall, 8 in. thick, laid flush with the inside of stone wall, in good lime and cement mortar. Point up complete.

Piers.—Build all piers of good, hard brick, laid in lime and cement mortar, and point up complete.

Chimneys.—Build chimneys as shown on plans, of good, hard bricks laid in lime and cement mortar; strike all joints on the inside and outside. Provide each room with a stovepipe hole, collar, and thimble, and cap them with a bluestone 1½ in. thick. Build the fireplace in kitchen for range, and furnish and set a bluestone hearth rubbed smooth, also a rubbed bluestone lintel, all complete. The jambs in the kitchen to be nicely pointed and laid up in select Hackensack brick.

Outside Cellar entrance to have bluestone copings and steps.

Cistern.—To be bricked up with good, hard brick, laid in cement mortar. An arch is to be sprung over the top, with a manhole and bluestone cover.

The inside is to be thoroughly cemented, and warranted water tight. The same is to have an overflow pit, and is to be connected with [illegible]

Cesspool.—To be stoned up dry in usual manner.

Privy Vault is to be stoned up dry in usual manner.

LATHING AND PLASTERING.

All walls and ceilings on first and second floors are to be lathed with spruce lath, and plastered two best coats of tempered mortar, and then hard finished hard and white.

CARPENTER'S WORK.

Timber.—All timber is to be of best quality hemlock. Corner posts, plates, and interties to be mortised and tenoned together, all 4" x 6".

All angles are to be braced with long braces.

First and second floor beams, 2" x 9", attic floor beams 2" x 8", all placed 16 inches from centers, and bridge all in a thorough manner, as directed.

Double all header and stringer beams.

All wall strips 2" x 4"; all openings to be studded with 3" x 4".

Rafters 2" x 8", placed 20" from centers.

Sheathing.—Cover the entire frames with dressed hemlock boards, put on diagonally, and put on resin sized sheathing paper over the hemlock boards.

Siding.—Cover the entire house, from sill to plate, as per drawing, with No. 1 narrow lap siding.

Shingles.—Cover the gables and lean-to over the piazza with regular sawed round and square butt shingles of California redwood, laid 6 inches to the weather.

Trim Corner Boards, Window Casings, and Water Table, 1¼" best white pine. Main cornice all as per detail, of best white pine; also piazza trim, cornice, columns, and rails of best white pine.

Roofs.—All main roofs are to be covered with best Bangor slate in best manner. The ridges are to be coped with galvanized iron and made perfectly water tight.

Bay window and porch on rear are to be tinned with best I. C. tin.

All gutters are to be tinned with best I. C. tin, to conduct all water through 3" leaders.

Windows.—All sashes to be 1½" thick, glazed with double thick French sheet glass. The upper sashes are to have marginal lights filled with cathedral glass.

Furnish all with the "Ives" sash fastener, complete, and hang all sashes on cord weights and pulleys.

Blinds.—All windows to have outside blinds, hung in pairs, on New York wrought iron hinges, and all to be furnished with proper fastenings.

Doors.—Cellar doors to be of heavy spruce dressed, hung on hook hinges and furnished with lock. Front doors 1¾ in. thick, moulded as per drawing, hung on 4 in. by 4 in. hinges and furnished with 4¾ in. "Niles" patent lock and bronze furniture, all complete. Vestibule door to be glazed in upper part and to have marginal lights filled with cathedral glass; furnished same as front doors. All doors, except closet doors, 1½ in., four paneled, white pine, hung on 3½ x 3½ in. regular loose pin butts, and furnished with the "Niles" patent mortise locks, brass bolts and strikes. All closet doors 1¼ in. thick, hung on 3½ x 3½ regular loose pin butts, and furnished with "Niles" patent locks. All inside doors, except sliding doors, are to have jet knobs and electro-bronze roses, No. 47 E; sliding doors are to be hung on Prescott's brace hangers and furnished with flush locks.

Floors.—All on inside are to l
4½ in. merchantable white pine
1¼ in. white pine, laid with
Piazza is to be ceiled in good and workmanlike manner.

INSIDE TRIM.

All window casings and door trim, 5 in. Queen Anne, with turned corner blocks; all good white pine. All windows to have aprons and stools. Base on first floor 1 in. x 9 in., on second floor 6 in., all good white pine.

Shelve all closets, and furnish all on second floor with hooks.

Stairs.—Newel on first floor, 7 in., turned cherry. Rail, 3½ x 4 in., double Queen Anne; balusters, 1¾ in., turned cherry; risers, ⅞ in.; treads, 1¼ in.; strings, 1¼ in.; all white pine. Attic stairs inclosed, built in a strong and substantial manner.

Cellar stairs built of dressed plank.

Sink.—Put in the kitchen an 18 x 30 in. sink, with drip board, all complete. Connect it with a 1½ in. lead trap, back vented, and run waste to 2 inch cast water pipe, with fresh air vent and trap, before leaving the cellar.

Pump.—Furnish and set a No. 70 Douglas No. 2 pump, connect with 1¼ in suction to cistern, all complete.

Range and mantels will be furnished by the owner and set by the contractor.

Outhouse.—Build in usual manner.

PAINTING.

All metal to be painted two coats of metallic paint in linseed oil. All woodwork on outside painted two coats of white lead in linseed oil. Stain the inside and varnish two best coats of No. 2 varnish.

Finally, do all that is necessary to finish the entire house in a faithful and workmanlike manner, ready for

NEW CREMATORY IN PARIS.

The municipal council of Paris has, by a majority of votes, granted a permit for the construction of a crematory edifice in the famous cemetery of Pere la Chaise, and the plans of M. Formigé, the architect, have been adopted.

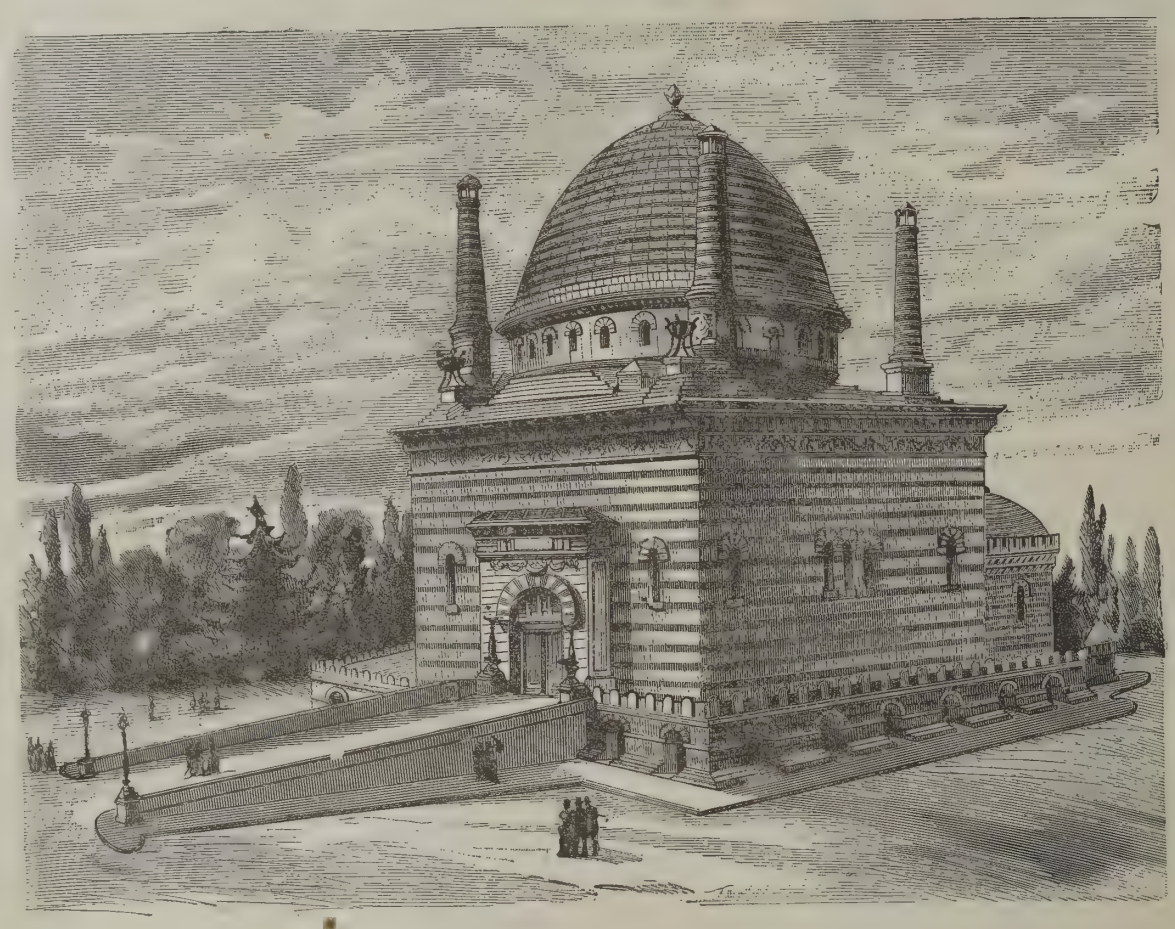
Our engraving shows an elevation of the edifice, which is located near the circular roadway of the cemetery, at one side of the street of Pyrenees. The exterior of the building presents the appearance of a Byzantine temple, having correct and severe lines. The rear portion of the structure contains the furnaces for cremation, constructed and arranged in the most superior manner. The work is to be finished in June, 1887. This is to be an experimental edifice, privileged for two years, and will not be made permanent if, during this period, the Parisian public should become opposed to the burning of dead bodies.

The Catholic population do not favor cremation, however great its hygienic advantages may be, and although, as a Milan paper says, it brings the consolation of knowing that purifying flames convert to ashes the remains of the dead.

Decorative Painting.*

Messrs. Winsor & Newton, of Rathbone Place, W., have brought out another handbook of their useful series on art, upon "Decorative Painting," the author of which is Mr. Owen W. Davis, architect, and a former contributor to this journal on subjects of the kind. The work treats principally of the decorative painting of rooms, and describes various artistic materials used for decoration. As a guide to the amateur and student, Mr. Davis' little manual will be of service, if only in checking extremes or a taste for bizarre productions met with in this field of art. The several apartments of a dwelling house are taken in order. For the hall, the green and russet variety of hues are recommended for a country house. Pompeian red or brown tints, with a self-color stencil for about two-thirds of the height from the skirting, not too declicate, finished above with distemper of rich cream color, is the treatment for the walls. The cornice may be in a stronger tone, picked out by color; the same breadth of coloring should be carried up the staircase, though the decoration may be more pronounced. The author does not advocate the customary dado decoration following the handrail rake of stairs, for the reason—and it is a good one—that it reduces the apparent width and disturbs the perspective of the walls. The "endeavor should be to make the ascent appear as easy and inviting as possible." This he proposes by carrying the horizontal lines through, and by introducing vertical forms or gradual, step-like decoration. The lower flight has the blocking courses carried through horizontally, with a star stenciled in alternate blocks. A decorative string terminates this blockwork on a level with the first floor landing, with a diaper filling above. A small vestibule or lobby opening on to a lobby may be treated in a rich decorative manner, and a Pompeian decoration is shown as suitable. For the stair soffit, a plain border with a simple diaper is effective, though folial designs in panels can be arranged to have a pleasing character. Designs for morning room, dining room, drawing room, boudoir, and library decoration are suggested, with scales of coloring appropriate thereto. Speaking of the dining room, the author says it should neither be somber nor dull, but massive and dignified. If there are oil pictures, the dominant color of walls should be subservient to them, and used as their background. The tones advised are purpled red, chocolate, leather color, and dead leaf greens stenciled with a brocade pattern in self-tint. Stamped leather paper is highly recommended for this room, which can be hand-painted. Linerusta-Walton makes a good dado, and the quieter it is the better, though a wood paneled dado two-thirds of height of wall is to be preferred. Referring to the tone of color of the drawing room, the author justly points out the value of attending to the aspect—a cold one demanding a warmer color than an aspect to the south or west. It is observed also that the hangings should determine the tone to be used as wall papers; and painting can be more readily obtained and made to harmonize with the curtains. A series of panels above the dado having the prevailing dado color, filled with designs of natural foliage on a plain or gold ground, with festoonings above this in the filling below the frieze, is suggested; the prevailing hues of the walls to be a gray green, and the ground of frieze a vellum tint with ornaments in the neutral green, and wall ground color aided by positive color and gilding. A suggestion is given for a painted ceiling in the Italian style. For bedrooms quiet and tranquillizing effects are necessary, and the Adam and Louis Seize styles are appropriate for wall and ceiling decoration, the woodwork in all cases giving the key to the cornices and ceiling; shades of green being useful. The scales of general tones given show the tints desirable in each case for framing, for wall filling, the mouldings, and ornament. The scales also suggests tints for the dado color, filling, frieze, and ceiling. The remarks on color are generally sensible, and the list of tints and pigments will be found of service. The observations on architectural features and on setting out the ornament are also useful, and Mr. Davis' book will be found a safe and artistic guide.—*Building News.*

* The Rudiments of Decorative Painting, etc. By Owen W. Davis, Architect. London: Winsor & Newton.



THE PERE LA CHAISE CREMATORY, PARIS.

A Note on Watering Potted Plants.

In the operation of watering potted plants, persons not practically familiar with plant culture are apt to make serious mistakes. Cultivators find by experience that an excess of water at the roots is very injurious to almost all plants, and hence it is usual to direct that great caution be used in the application of water, especially in winter. The result is that frequently the opposite extreme is fallen into, to the great injury of the plants. From the moment that the soil becomes so far dried that the fibers of the roots cannot absorb moisture from it, the supply of the plant's food is cut off, and it begins to suffer. Some plants can bear this loss of water with more impunity than others; some again, and the heath family among the rest, are in this way soon destroyed. The object in watering should be to prevent this stage of dryness being reached, at least during the time a plant is growing, and at all times in the case of those of very rigid structure; at the same time, that excess which would sodden the soil and gorge the plants is also avoided. Within these limits the most inexperienced persons may follow sound directions for the application of water with safety. But whenever water is given to pot plants, enough should be employed to wet the soil thoroughly, and the difference between plants that require less or more water should be made by watering more or less frequently, and not by giving greater or less quantities at one time.—*Farmer's (Irish) Gazette.*

To Imitate Ground Glass.

Put a piece of putty in muslin, twist the fabric tight, and tie it into the shape of a pad. Well clean the glass first, and then apply the putty by dabbing it equally all over the glass. The putty will exude sufficiently through the muslin to render the glass opaque. Let it dry hard and then varnish. If a pattern is required, cut it out on paper as a stencil plate, and fix it on the glass before applying the putty, then proceed as above and remove the stencil when the dabbing is completed. If there should be any objection to the appearance of clear spaces, cover them with slightly opaque varnish.

Composition for Making Artificial Marble.

In compounding this composition, which is the invention of Mr. Carl Straub, of Syracuse, N. Y., glue and water are mixed together under a moderate heat, so as to produce a thick fluid, to which is added a quantity of boiled linseed oil. After the oil has been thoroughly intermixed with the gluey fluid, either muriatic or sulphuric acid is added. This mixture is stirred for a short time, having been kept heated up to this point, and is then stirred till cool. After cooling it is allowed to stand for three days, during which time it is occasionally stirred. This solution may be kept almost any length of time; and when it is desired to form any quantity of artificial marble, one part of the solution is mixed with twenty parts of water in which the mixture readily dissolves. Plaster of Paris is then sprinkled into the diluted solution, which is stirred while the plaster is being added. Enough plaster is added to form a dough as thick as moulding clay, and which should be thoroughly kneaded. After the dough is formed, it may be pressed into any shape or form desired, and may be colored by any of the well-known pigments.

This marble is particularly well adapted for ornamental work, as it is easily and quickly manipulated, and is capable of receiving a high polish. The dough, of course, can be pressed into ornamental shapes and forms as well as into plain, flat tablets.

Stained Glass Substitutes.

During the past few years the use of stained or "cathedral" glass, formed of small panes held in lead work, has considerably increased. The effect is excellent where a good design is chosen. The colored tints help to make a room cheerful, while, in both rooms or windows having a disagreeable outlook, in churches and in vestibule doors and transom lights, it is very effective. There is only one objection to the use of cathedral glass. It is very expensive, and especially where anything like an elaborate design is chosen.

Mr. W. C. Young, of 731 Arch Street, Philadelphia, Pa., is now manufacturing, under his patents, a substitute composed of thin, tough sheets of linen, treated in such a way as to make an excellent imitation. The material is colored and is semi-transparent, and, being applied to the surface of the glass, it gives the effect of the opaque leads and richly colored stained glass in a very striking manner. It is quite durable, is easily applied, and may be had in a great variety of designs, of all sizes. Mr. Young publishes a fully illustrated and colored catalogue, and will send it free of cost on application.

Invisible Nails.

For attaching mouldings and other light lumber, a new kind of nail has been contrived, which leaves no nail holes. It is made with a point at each end, and with an outwardly projecting head or shoulder, midway between the points. The nail is first driven into the wood by means of a punch, which straddles the protruding point and bears on the head. When enough have been driven in, the moulding is placed over the nails and driven down.

Health in Schools.

In a voluminous report of Medical Inspector Taylor, presented to the board of health, the sanitary condition of the public schools of Philadelphia seems to show the presence of elements decidedly prejudicial to health. The chief fault appears to be in the dangerous proximity to the buildings of wells which are in a very fo tl condition. Nothing is more probably responsible f th fevers and diphtheria than are these odor-giving a w miasma-breeding pools, and the danger from them th heightened when so many children are gathered gether in places which at best afford scanty air po poor ventilation. flo

A CITY RESIDENCE.

We give from the *Building Budget* a sketch of the residence of Mr. C. Thompson, from a pencil drawing by the architects, Messrs. Treat & Foltz, of Chicago. This is a substantial and attractive design.

Specifications for Plumbing, Gas, and Natural Gas Fitting.

BY L. O. DANSE, C.E., ARCHITECT, PITTSBURG, PA.

The following specifications are those prepared by me for two brick dwellings for Mrs. Bailey, to be erected on Murtland Avenue, East End, Pittsburg. For houses built to rent, I think the plumbing is extra good—better, in fact, than many persons put into their own houses; yet, had the houses been for personal occupation of owners, I should have insisted on using brass pipe for hot water instead of galvanized iron. The use of a terra cotta chimney top to hide vent pipes is original.

GENERAL CONDITIONS.

Contractor to supply all materials and labor requisite for the full and perfect completion of the entire work; to give it his personal supervision, keeping a competent foreman constantly on the ground, and to guarantee the work for one year from date of acceptance of same, making good any defects which may arise during that time from improper work or [illegible] material. It is understood that this guarantee does not extend to such defects as may arise from causes beyon control of contractor during duration of said guarantee. He shall not retain on the work any man found incompetent or improper by the architect; and shall do his work in such a manner and at such times as not to retard the other mechanics on the buildings.

PLUMBING.

Tap main on Penn Avenue and lay in trench, four feet six inches below surface, a two inch cast iron service pipe, weighing not less than sixty-seven and one half pounds per length of seven feet, with carefully calked joints containing two and one-half pounds of lead each, with service cock and box at curb and at point where each branch leaves main line. Length of main supply pipe to be seven hundred and thirty feet.

Branch for each house to be one inch galvanized iron pipe with galvanized malleable fittings. To have stop and waste at point where it enters cellar, and run along partition wall of cellar at a uniform grade of one inch to one foot to point directly opposite the waterback connection in kitchen, where it shall have a one inch by three-fourth inch by one inch T, then rising to point four inches below ceiling of laundry, crossing to rise along flue and connect with waterback. Must be supported at least once in every length of the horizontal parts by wrought iron pipe hooks, firmly driven into walls and so arranged as not to interfere with expansion and contraction.

Run three-fourth inch XX strong lead pipe from T on service pipe, connecting to same with lever handle stop and waste, rough, along wall to supply wash trays, each of which shall have five-eighth inch compression wash-tray cocks.

Hot water supply to laundry to be three-fourth inch galvanized, with malleable galvanized fittings, and to come down from boiler along inner face of chimney jamb, then across ceiling at uniform grade of one-half inch per foot, down beside cold water riser and parallel to branch from same to tray. To have stop in kitchen.

Set thirty gallon Scarfe's patent dome head kitchen boiler on wall plate and supported by three-eighth inch iron rod with nut below plate and attached to joist above by screw eye of same size iron.

Set fifteen inch by twenty-three inch cast iron sink with hot and cold supply through three-eighth inch XX strong lead pipe, with five-eighth inch Dougherty self-closing bibbs; supply pipes to be carried on chimney jamb, and not on outside wall.

Supply to bath room through three-fourth inch XX strong lead pipes, carried along chimney breast and stair partition at a uniform grade of one-half inch per foot, with branch riser to W. B. of five-eighth inch XX strong lead pipe. Branch riser to W. C. tank to be one-half inch XX strong lead pipe, and supply to B. T. to be three-fourth inch XX strong.

Furnish and set six-foot (16 oz.) planished copper bath tub, with nickel plated double bath cock for three-fourth inch supply pipe, rubber plug, and chain, and four pound lead safe under all, with one-half inch drip pipe carried down to laundry and left exposed there.

Furnish and set Paragon "B" solid square top porcelain bowl and trap combined back outlet, washout W. C. with enameled double tank and seat action, cherry seat finished in light varnish without stain, with one and three-fourth inch heavy lead flushing pipe, as made by Standard Manufacturing Company.

Furnish and set style "A" 20 inch by 20 inch marble corner slab, with 13 in. porcelain basin, five-eighth inch self-closing Dougherty nickel plated basin cock and "Star" rubber plug, with chain and nickel plated chainstay.

Furnish and set wash pave in north wall of each building, with terra cotta drip stone and gutter tile, to discharge into branch of sewer. Supply to be through three-fourth inch galvanized pipe, and to draw from opening toward service pipe.

Trap each wash tray, sink, wash stand, and bath tub separately with one and one-fourth inch Sanitas trap to one and one-half inch (5 pound) lead waste pipes, calked into porcelain lined Y branches on soil pipe by means of brass ferrules wiped to pipe.

Soil pipe to be three inch porcelain lined "Standard" from outside of cellar wall, where it is to be carefully cemented into sewer, to be hereafter specified; to have three inch enameled running trap immediately inside wall, and three inch by three inch enameled T vent to it. Run three inch enameled vent pipe from T up and through wall below surface, menting same into three inch glazed earthenware pipe, laid with cemented joints, and bring to surface 18 feet from building with a cast iron grating at top.

Waste from wash trays to enter enameled T next to one for vent pipe.

Carry soil pipe along partition wall to within six inches of door opening, then rise and carry along the ceiling to foot of recess for riser. Provide one double Y branch, enameled, below ceiling of first story for waste from B. T. and W. B., and separate Y branch, enameled, for W. C. in thickness of floor, running soil pipe full size to top of chimney crock provided on ridge for that purpose. One-eighth bend will be required to turn pipe between rafters and another to turn up again at ridge.

Run two inch wrought iron vent pipe from bowl of W. C. parallel with soil pipe to roof. Make both tight to roof with sheet lead.

All joints of soil pipe to be made with melted lead, well calked, and hemp. No rags, paper, shavings, or putty to be used. Each section of vertical pipe to be supported by ears or bands, and all horizontal sections to be supported by wrought iron hooks and to have a uniform grade one-half inch per foot, with no pockets for retention of water.

Put up Standard "Acme" hopper water closet, number 311, as shown, in cellar, with round self-raising seat, enameled hopper on enameled one-half S trap, with one-half inch XX strong supply pipe, branching through partition wall from W. T. branch, and having stop and waste at lowest point so as to drain entire branch to main supply pipe. Trap of hopper to be calked into three inch enameled pipe reaching through wall and cemented into branch of glazed sewer. Tap trap for two inch gas pipe vent to run through wall and up same to roof.

All lead pipes used in this work to be supported by tacks soldered to pipes and screwed to boards to be provided by carpenter for that purpose. Tacks to be four feet apart on horizontal parts and six feet apart on vertical parts. Where the word horizontal is used, a grade of one-half inch to the foot is meant, unless otherwise specifically stated. All pipes to be kept in full view none being placed behind plaster or wainscot.

All connection between lead and galvanized pipe must be made by means of brass ferrules wiped to lead pipe and screwed into galvanized pipe.

Connection to soil pipe must be made with Raymond's combination ferrules.

When work is completed, the peppermint test must be satisfactorily made in the presence of the architect before same is accepted.

SEWER.

Lay six inch vitrified sewer pipe on grade of not less than one-half inch to the foot from well to Y where branches run to each building. Lay five inch branch to each building, with four inch branches to surface at each conductor shown on plans and at wash pave. Fit in separate four inch Y and branch, to each soil pipe. Cement all joints perfectly tight.

GAS FITTING.

A one and one-half inch wrought iron service pipe 730 feet long must be laid from main on Penn Avenue, with stop and Rickett's patent ventilated service box at curb, and additional stop and box for each house in same ditch with water.

All piping must conform to the rules of the company furnishing the gas.

No joist shall be cut more than eighteen inches from its bearings.

Ceiling lights to come [illegible] cer hal floc inc one [illegible] fourth inch beyond finished surface of plaster and be capped until such time as fixtures are put on. Put meter on shelf in cellar, immediately under vestibule.

Run all pipes in such a manner as to all drain to a common point; having no pockets for accumulation of water, etc.

NATURAL GAS.

Service pipe two inches diameter, of wrought iron, with stop to each house and Rickett's patent ventilating service boxes, to be laid from Penn Avenue in same ditch with water service.

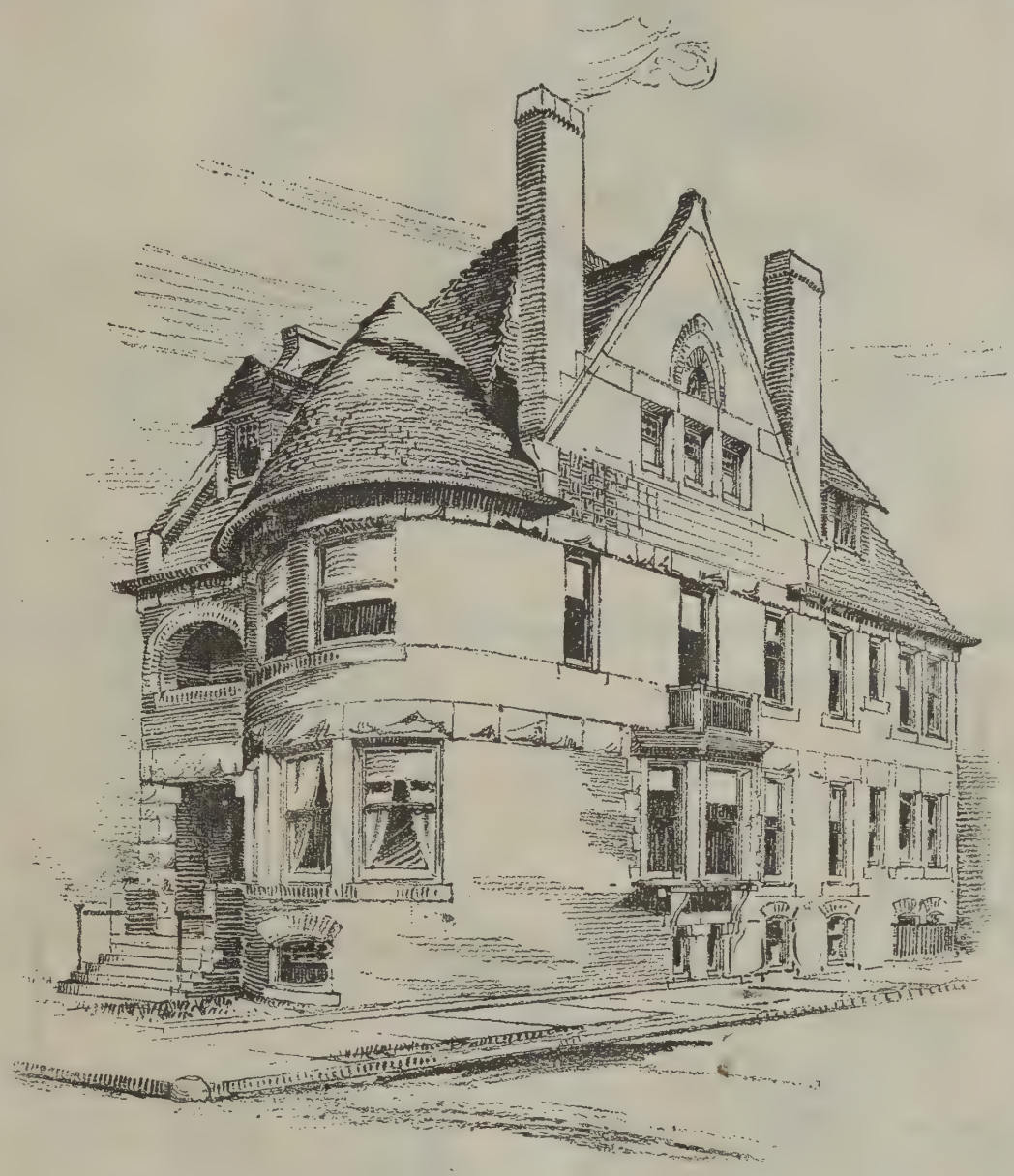
Regulator to be placed in areas as shown on front of houses.

Run one and one-half inch pipe from main service pipe to regulator, and one and one-half inch pipe from regulator through cellars, with one inch laterals to all flues colored blue on plans, and three-fourth inch risers in said flue. Take three-fourth inch branch from laterals through hearth to each fireplace in first story; and three-fourth inch branch for laundry stove down through flue to level of burner in stove.

Branches to fireplaces to come through walls of flues, stone hearths, and all visible pipes except those in cellar, laundry, and kitchen, shall be nickel plated and polished.

Nickel-plated screw valves with self-packing stems, of approved pattern, are the only form of stops permitted in this work.

Provide "Standard" burner for each fireplace, range, and laundry stove.



A CITY RESIDENCE.—TREAT & FOLTZ, ARCHITECTS, CHICAGO.

All fittings to be malleable iron, galvanized, except those in finished rooms, which must be brass, polished and nickel plated. All work to conform to regulations of fire marshal and board of underwriters.

A DWELLING AT SPRINGFIELD, MASS.

This cottage was recently erected in Springfield, Mass., and represents a house of modern design, conveniently arranged, and of moderate cost ($3 500), using best materials.

The hall is ample, with parlor, library, and dining room connected by sliding doors, with fireplaces in the adjacent corners of each room.

There are five chambers, with bath room and closets, on second floor, with two bed rooms and ample room for storage on attic floor.

The foundation is of brick, 13 in. thick up to grade line, and 9 in. thick above to sill. The cellar is 7 ft. high, with cement concrete for cellar bottom. Brownstone is used for window sills and hatchway steps.

The frame of the building is of spruce, covered with matched spruce boards laid diagonally (on this building they were laid to the northwest, as the prevailing winds are in that direction), overlaid with paper. The outside finish is of pine, with pine clapboards and bands of cut shingles. The roofs are of narrow matched pine boards overlaid with tarred paper, and covered with Chapman slate, 6×12, with lower edges cut.

The inside finish to be of ash, except kitchen, which will be of pine, grained in cherry. The doors are made of pine, with panels of ash to correspond with the inside finish of adjoining rooms. The upper floors of kitchen to be of black birch; remainder of house, pine floors.

GEO. H. BLANDEN,
Architect.
Springfield, Mass.

A DWELLING AT SPRINGFIELD, MASS.

Petroleum V. Nasby on Socialism.

I hate a capitalist, no matter how he becum one. I hate the meenspirited, grovelin retch wich will work ten or more hours a day, deprivin hisself uv beer, and terbacker, and cards, and bilyards, and hos racin, and sich, savin peny by peny til he hez ground enough out of the world to hev a shop uv his own, and to employ other men to slave fur him, and thus go on akumulatin til he owns things. Such men are monopolists, and the enemies of labor, and grinders.

I hold that the possession of a ten dolar bil makes a monopolist, and al sich shood be crushed. Ez hevin a ten dolar bil makes a man a monopolist, his monopolism increases jist in proporshen to the ten dolar bils he hez. The owner of a factory is a enemy to the human race, and ez for the man who bilds a ralerode, he

> "Is a monster uv such hidgus meen,
> That to be hated needs but to be seen."

My hatred of railroad managers is intens. It commenst with the first time I wuz drop off the hind platform uv a trane for not payin fare, and hez increst with every repetishun uv the ofense, which generally happens every time I want to go anywhere. I lothe the ralerode monopolist.

A grindin monopolist is any man wich has anything. Whenever a man hez saved anything, he becomes a capitalist, and ez capitalists are dangerous to labor, he should be made to divide it up, so ez to be on a ekality with them wich never saved nothing.

The mechanic or workingman wich saves so ez to own a house or a farm becomes a capitalist, and consekently a grindin monopolist, and ez accumolashens are dangerous to labor,—wat he hez shud be confiskated and divided up among us wich hezn't anything. Property is a crime.

I ain't jist shoor that I hev got the socialistic doctrine down fine enuff, but I think these definishuns will do, espeshly when you howl em under a red flag to luvers uv humanity wich is chuck full of stale beer.

Brickmaking Under New Conditions.

A few years ago the making of bricks was deemed to be all but impracticable at any site which did not itself contain the raw materials required for the manufacture. Now, however, Taylor & Neate, Medway Works, Rochester, have introduced slurry pumps, by the use of which the brick manufacturer is enabled to prepare his earth upon the site whence he draws his supply, and convey it thence in a liquid state through iron mains to the brickfield, where it is intended to be converted into bricks. In this way Smeed, Dean & Co., Sittingbourne, have lately obtained an enormous supply of fresh brick earth from a property about a quarter of a mile east of Tonge Church, and nearly two miles distant from their present brickfields. The most important feature of the undertaking is the set of pumps for pumping the washed brick earth through a cast iron pipe main to the brickfields, which are the largest and strongest pumps that have ever been made in the district for brickfield purposes.

House to House Inspection.

The Illinois State board of health has received the report of the house to house inspection made by the board of health of the city of Springfield. This is by far the most complete and thorough inspection that has been made by any town or city in the State, and reflects great credit upon the city and the superintendent, Dr. B. Barret Griffith. There were found to be in the city 4,738 houses; the sites of 4,094 were good, 437 fair, and 207 bad; only 453 are sewered. Of these, 7,320 are built of wood, 1,009 of brick, and 19 of other materials. The basements or cellars of 2,188 were dry and 724 damp, while the ventilation of 2,329 was good, 271 fair, and 252 bad, and the general condition of 2,359 was good, 248 fair, and 194 bad. There were found 1,747 cesspools, sinks, and drains in good condition, 150 fair, and 90 bad, 1,505 of these connecting with sewers; 3,075 privies were found in good condition, 434 fair, and 582 bad, 96 of them having connection with sewers. Out of 466 water closets, 427 were found in good condition, 20 fair, and 19 bad; 444 have connections with sewers. The yards of 3,879 were in good condition, 316 fair, and 261 bad.

Of the hydrants, 475 were found in good condition, 337 fair, and 1 bad; 3,085 cisterns were in good condition, 39 fair, and 48 bad, while 3,577 wells were in good condition, 225 fair, and 115 bad. Of these latter, the water in a number was examined and found to be unfit for use, and they were accordingly condemned, owing to their contamination from surface drainage and privies. This was one of the most important facts elicited in the investigation, and shows the great necessity of preserving wells from pollution, especially where the general water supply is not what it should be, owing to local causes.

During the time of inspection there were found 152 cases of sickness, showing the general health of the city to have been very good. Some of these cases were attributable directly to the water supply.

The vaccinal status was found to be as follows:

Adults vaccinated	15,637
Adults not vaccinated	1,353
Adults revaccinated	9,184
Children vaccinated	6,866
Children not vaccinated	3,041

There were found 3,716 nuisances and defective conditions affecting life. Nearly all have been abated or removed. Maps of the water supply and sewerage accompany the report. All this has been accomplished at the trifling cost of $947.50.

The Tehuantepec Ship Railway.

E. L. Corthell, chief engineer of the Tehuantepec Ship Railway, delivered, on December 20, before the New York Academy of Sciences, in the Hall of Columbia College Law School, an address on the Isthmian Railway. Mr. Corthell having gone through an exhaustive account of the historical precedents of ship transportation in the past 2,400 years and having by statistics shown that the proposed Tehuantepec route was the most feasible for the purpose, gave an account of the mechanical devices and plans, their cost and advantages. He brought numerous statistics to bear to show the economy of the scheme on account of the traffic which, because of the abolition of an ocean voyage of 11,000 miles, would pass over it.

This traffic he estimated at almost 6,000,000 tons. He then descanted on the general benefit to mankind resulting from its enabling civilization to advance with more rapid strides. He expressed confidence in its ultimate success, and declared that Suez furnished a precedent as to the country into whose hands this grand achievement will eventually fall, should the United States take no decided national interest in it.

"This work when finished," he concluded, "will be the realization of the ardent wish of statesmen and philanthropists everywhere, the dream of kings and conquerors during the last 350 years, and a fitting supplement to the grand achievements which have marked the progress of the nineteenth century."

A COTTAGE AT HALIFAX, N. S.

We give a sketch of a suburban cottage designed by C. H. McClare, architect, Cambridge, Mass., for a gentleman at Halifax, N. S. The building is of wood, the outer walls and roof to be covered with sawn shingles, stained a warm color before laying, the roof to be darker than the walls, and the finish and copings a lighter color.

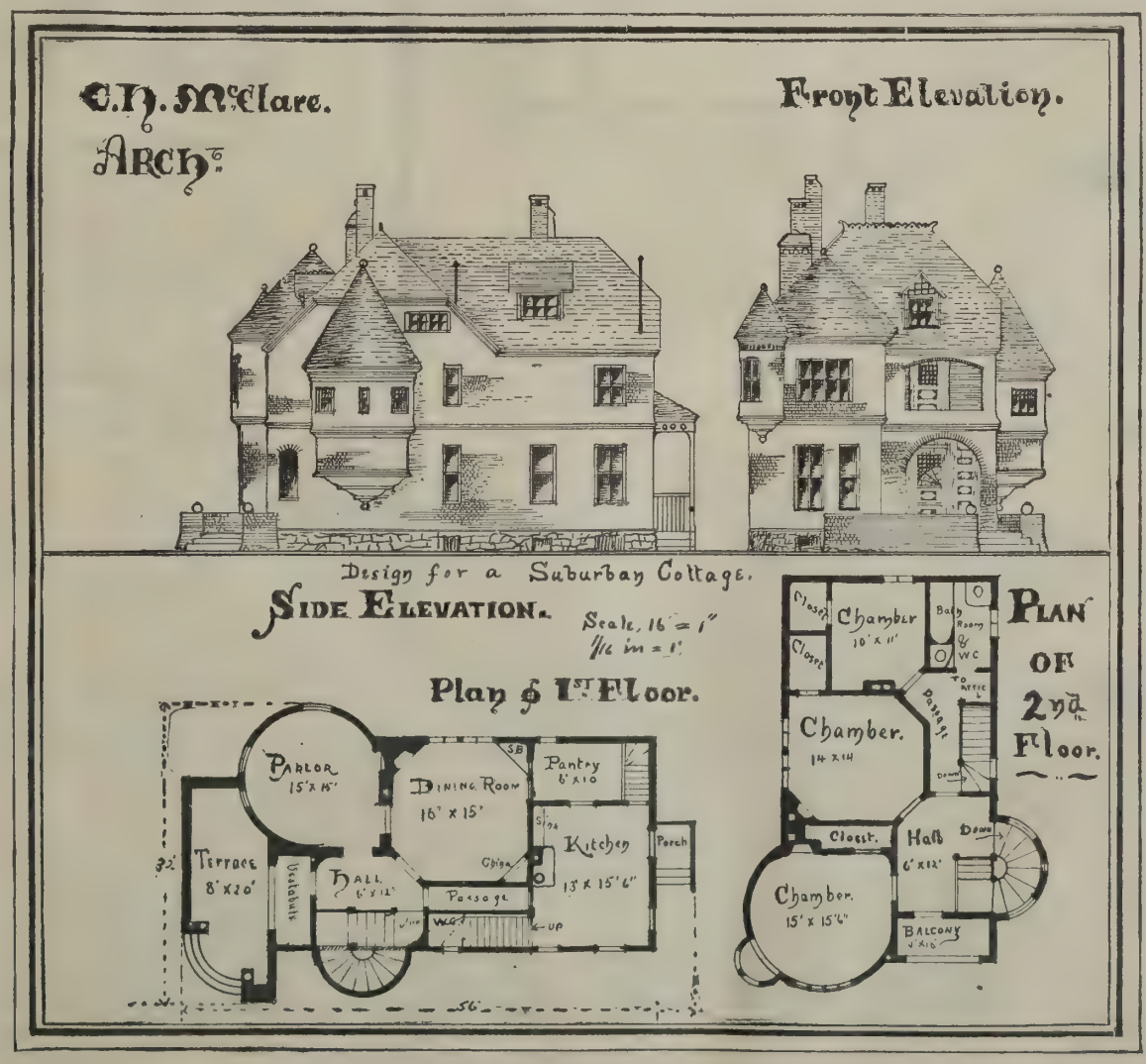
The rooms all of good size and convenient, as the plans show, with three on each floor, with closets, halls, etc.

The first story will be 9 ft. 3 in. between floor and ceiling, the second floor will be 8 ft. 3 in., and the attic will be 7 ft. 6 in., and will be finished in pine, painted. It will contain two bed rooms and a store or lumber room, with closets. The second story will be finished in whitewood, stained cherry, and have open grates for soft coal; the bath room and water closet is on this floor. The parlor will be finished in cherry, including mantel for open fireplace. The dining room and hall is to be finished in English oak, which includes a large mantel and sideboard in the dining room.

The vestibule to be finished in oak, paneled as shown in the sketch.

The kitchen and pantry to be finished in pine, natural or an oil finish. A set range, with hot water tank, is in the kitchen, also stairs to cellar and next floor. The cellar to be concreted and contain a furnace and laundry.

The cost to complete it is estimated at three thousand dollars in that locality.



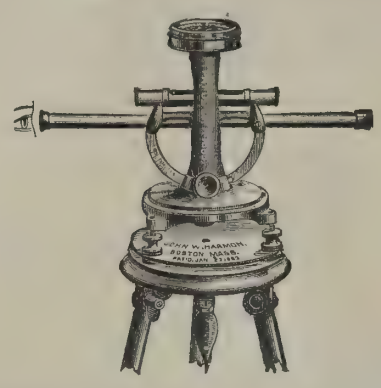
A COTTAGE AT HALIFAX, N. S.

Concrete Floor.

If the wet state of the concrete floor does not arise from land springs or some other source beneath, then it can only be from condensation. The impervious character of good concrete and Portland cement, and the comparative coldness of the surface, are sure to cause—if there is no artificial heat in the room—that appearance of an irruption of water which many persons cannot believe arises simply from the condensation of moisture with which the atmosphere is heavily charged in damp and changeable weather. The only remedy is to cover the floor with a carpet, matting, or some material of a higher temperature than the floor; but of course this does not dispel the watery particles held in suspension. Obviously, such a floor is not healthy, for it does not hold or retain moisture but for a short time. This applies to concrete walls as well as floors, and is direct evidence that the atmosphere is at the time too damp for the room to be occupied without some form of artificial heat being introduced to make the air drier, and a single lamp will often effect this and prevent all appearance of moisture. I have known a doctor report a concrete cottage as being unfit for habitation, as moisture runs down the walls; but a candle burning through the night having to all appearance prevented it, he acknowledged he was mistaken.—*Thomas Potter, Building News.*

A NEW LEVELING INSTRUMENT.

The advantages of an accurate and easily adjustable leveling instrument in setting out buildings on the ground is well understood by builders and contractors. The time saved is considerable, and the exactness which is so necessary in this description of work is, to a great extent, insured. The instruments hitherto manufactured have been, as a rule, so expensive as to preclude their general use, excepting in the more extensive works.



HARMON'S NEW LEVELING INSTRUMENT.

Mr. John W. Harmon, of 65 Haverhill Street, Boston, Mass., is the manufacturer of an improved level of considerable completeness and utility. Its general form is shown in the engraving. The simplicity of construction enables the manufacturer to sell at a very moderate price, while the whole arrangement of parts is specially designed to insure accuracy and speedy adjustment.

The special points of construction are protected by patents, and consist of the central stand, provided with a circular gauged flange and a centralizing pointer, with the adjustable screws.

The instruments are supplied either with or without the magnetic compass, and may be used either as a level or theodolite for the various purposes of architects, builders, contractors, engineers, and others. It is claimed that they will do all that is required of the more expensive instruments, excepting where the distances are of very long range.

IN the manufacture of a pair of ordinary window sashes, it is necessary to make twenty-four mortises; and in a common door or pair of blinds, from twelve to sixteen mortises.

Air in Greenhouses.

The circulation of air is one of the most important provisions in all kinds of horticultural buildings. Nothing but that will fairly exclude damp, or in any damp weather counteract its effects. It is not enough to open every front window. It would be far better to open only one and let down a top light a little. In all cases there should be an outlet as well as an inlet, and for want of this many houses do not answer well for plants. A circulation of air causes a more rapid evaporation, and it is a common thing among good gardeners to open a lower window even in wet, cloudy weather. Let down one of the top lights a little, and light a fire. By this a free circulation is created and the house dried, although it were in the midst of rains and cloudy weather. It is too common a thing to see the top lights let down to give air to a house, and no other part opened. This is all wrong; for there should be a draught. On the other hand, we see all the front windows and no top lights down. Many persons build pits three or four feet high at the back and half the height in front, and no air but what can be obtained at the top. We would always provide air holes at the bottom, as without such there can be no draught, no free circulation. When pits are built without this provision, the best mode of giving air is to pull up one light to let in air at the foot of it, and push down the next to open at top, and so on alternately through the whole range of lights, however long the pit may be. It is the same in giving air to a hotbed, only that when the air is rarefied, as it is inside, tilting the light a little lets out the steam, and the cool air will get in somewhere; but sometimes when a frame is made too close and the glass is puttied at the joints, things fog off in spite of tilting, because there is no circulation.

Advantages of Low Ceilings.

Rooms with low ceilings, or with ceilings even with the window top, says the *Popular Science Monthly*, are more readily and completely ventilated than those with high ceilings. The leakage of air which is always going on keeps all parts of the air in motion in such rooms; whereas, if the ceiling is higher, only the lower part of the air is moved, and an inverted lake of foul and hot air is left floating in the space above the window tops. To have the currents of fresh air circulating only in the lower parts of the room, while the upper portion of the air is left unaffected, is really the worst way of ventilating; for the stagnant atmospheric lake under the ceiling—although motionless—keeps actively at work under the law of diffusion of gases, fouling the fresh currents circulating beneath it. With low ceiling and high windows no such accumulation of air is possible, for the whole height of the room is swept by the current, as the dust of the floor is swept with a broom. Low ceilings have also the advantage of enabling the room to be warmed with less expenditure of heat and less cost of fuel. The above does not agree with the generally accepted idea of the height of rooms in dwellings, but the authority is good, and well worthy of consideration by persons about to build.

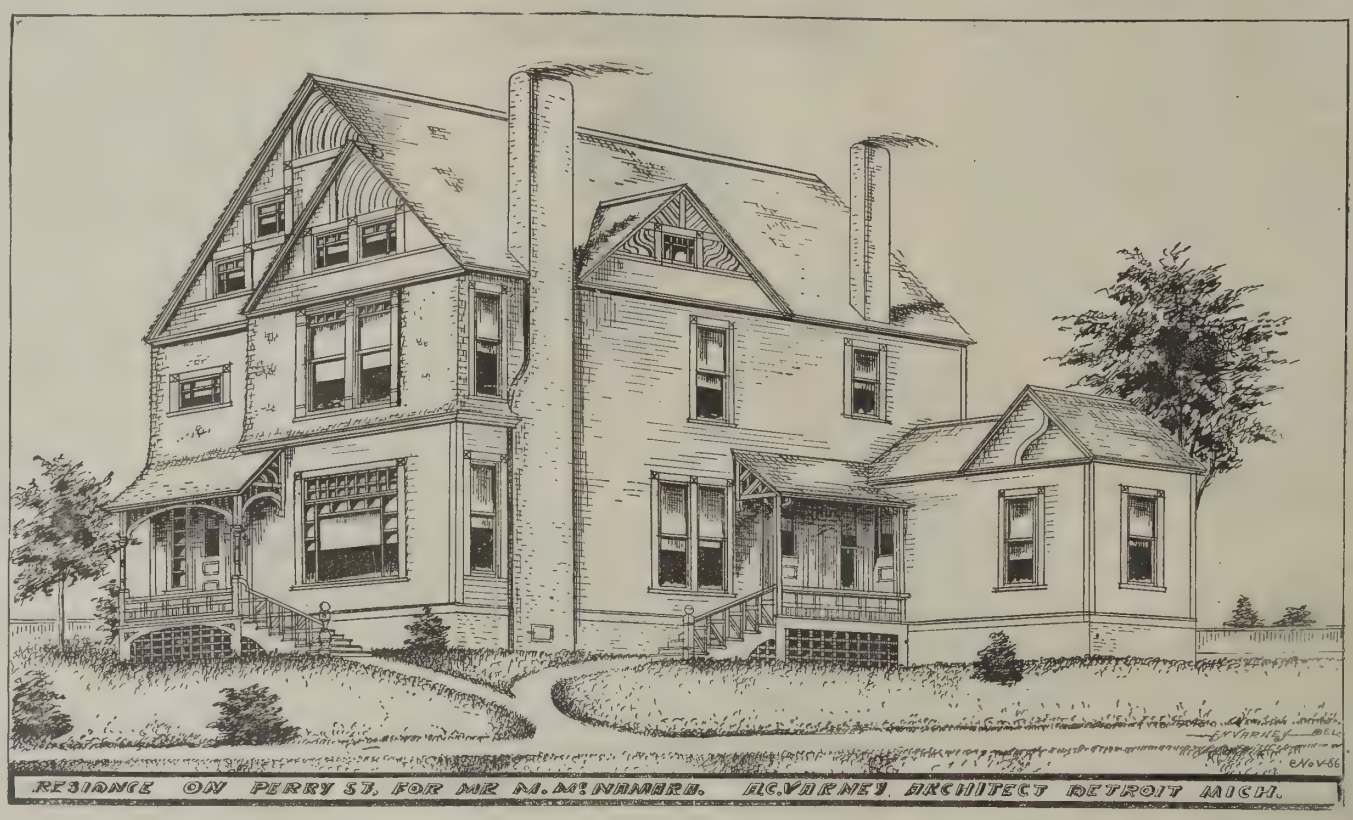
Distempering Ceilings.

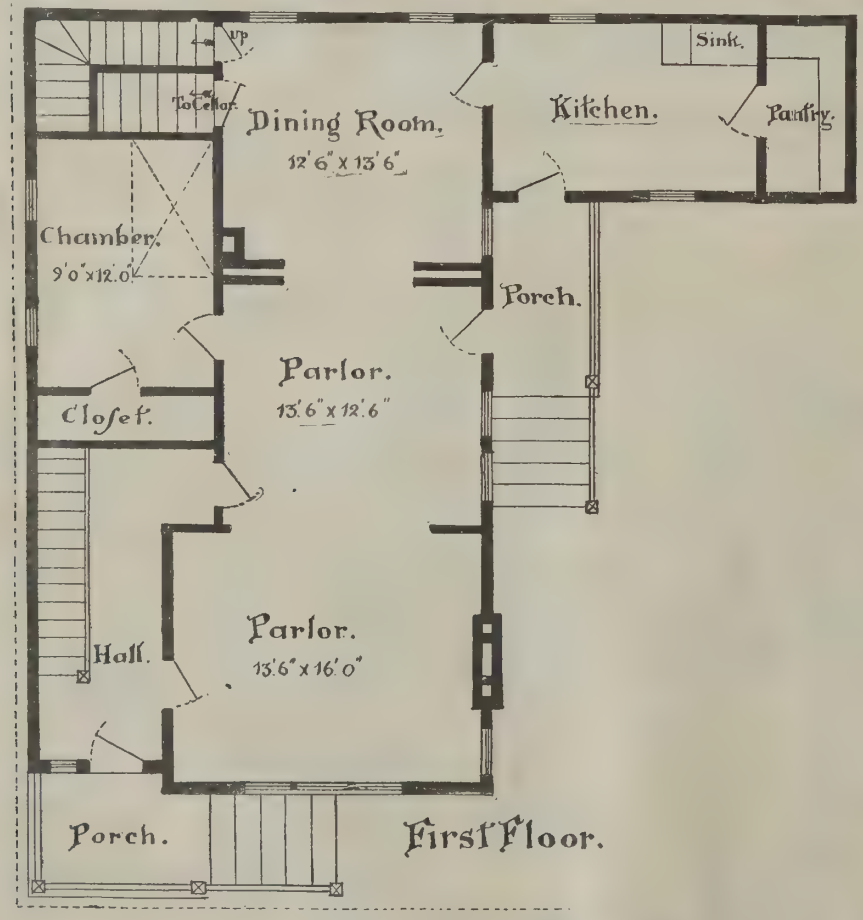
Give the ceilings a coat composed of soft soap, lime, putty, and size. The quantities to be used of each ingredient entirely depend on the finish of the ceiling; some are much more absorbent than others. The soft soap prevents the dry plaster absorbing the color too quickly, so that a clean, even surface may be obtained with the finishing coat. If the workman is not a practiced hand, he may be successful in laying an even coat of distemper; and even if he should succeed, if his ceiling is gray finished, the sand will probably spoil the distemper.

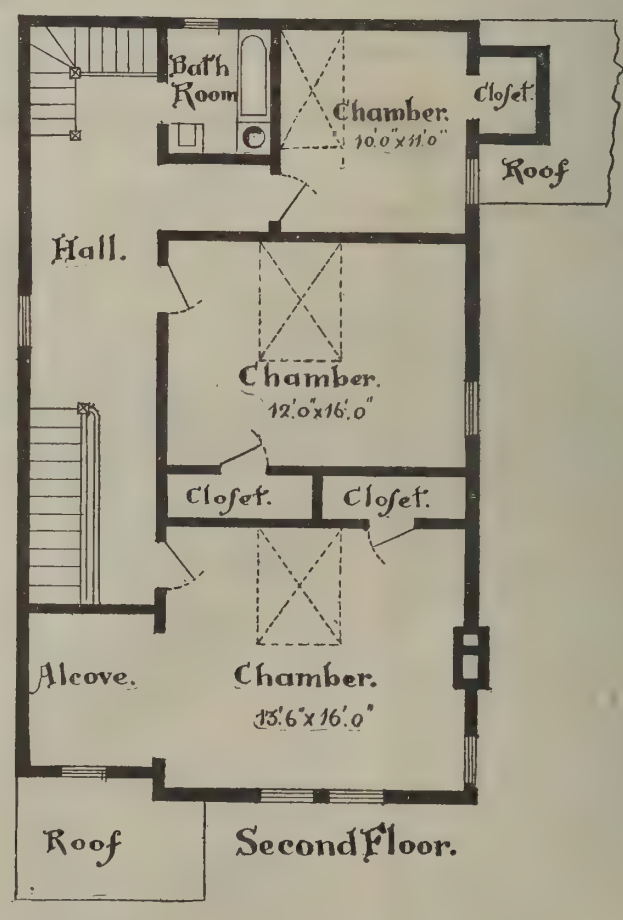
FURNITURE POLISH.—Equal parts sweet oil and vinegar and a pint of gum arabic, well powdered; shake the bottle and apply with a rag. It will make the furniture look as good as new.

A $2,200 RESIDENCE AT DETROIT, MICH.

We give a sketch of a frame house now being built on Perry St., Detroit, Mich., for Mr. M. McNamara, from plans made by A. C. Varney, architect, Detroit. The cost will be about $2,200. The house consists, on first floor, of hall, parlor, back parlor, dining room and kitchen, and one large chamber; and, on second floor, four neat chambers and bath room. It has a good cellar under the dining room. The remainder of house rests on brick piers. It is finished inside with pine and hard oil finish.







A $2,200 RESIDENCE AT DETROIT, MICH.

Removal of Snow from Streets.

The difficulty of cleaning the streets not only is perennial, but it is one that becomes more disagreeable, and yet more imperative, with the increase of traffic and the growth of population. The streets of New York are frequently choked by the throngs of vehicles even in the best of weather, and of course a heavy fall of snow makes matters worse. In addition to the trouble thus caused, the accumulations of snow are sources of annoyance to pedestrians, and the filth collected in the slushy mass is a serious danger to health.

The expense of carting away the snow has been variously estimated to range from seventy-five cents to one dollar per cartload; but even at fifty cents per cartload it is manifest that to properly clear the streets would cost enormously. Take, for example, one street block 200 feet long and say 50 feet wide, having a surface area of 10,000 square feet. A moderate snowfall of three inches of snow will give 2,500 cubic feet on that one block of street. Assuming that in loading this is packed down to nearly half—say 1,350 cubic feet—there would be 50 cubic yards of snow to be carted; and allowing two cubic yards as the outside limit of each load, there would be 25 cartloads to be taken from each block, at a minimum cost of $12.50, or $250 per mile, for every snow storm.

The use of steam has often been suggested, and we have described in our columns various forms of steam apparatus, but they have generally failed to give satisfaction, in part because they are not sufficiently expeditious, and in part because they were too expensive. In New York, Lockport, and other cities where steam distributing companies have laid mains, attempts have been made to melt off the snow by turning upon it live steam. This plan melts the snow very fast, but in nearly every experiment there has been an enormous loss of free steam in proportion to the work done.

Recently, Mr. Charles E. Emery, C.E., Chief Engineer of the N. Y. Steam Company, has employed a novel apparatus with such success that it bids fair to solve the problem. While it is probable that it can be operated more expeditiously and economically by using steam taken from underground supply pipes, its use is not limited to this supply. Any locomotive or movable boiler could be employed. All that is needed is to keep the steam in contact with the snow without letting a great portion of it escape before touching the snow. For this purpose a broad, light, rough, and strong sled, with openwork runners, is fitted with a short pipe passing through the top of the sled, having a hose coupling at its upper end. A tarpaulin, or canvas spread, about 25 feet square, made steam tight, extends from the sled as a center, and the hose coupling passes through it. The tarpaulin is piled on the sled until it is drawn to the place for beginning work; the tarpaulin is then spread out upon the snow to its fullest spread, the edges are tucked into the snow, connection is made by hose from a boiler or steam pipe to the sled, and the steam is turned on, a pressure of 40 pounds being sufficient. The steam cannot escape into the air, but is held right down to the work required of it; and in a very few minutes the deepest snowbank or the iciest packed roadbed yields to the heat and runs off as water. By repeating this operation a street can be cleaned in a very moderate length of time and at small expense. The three inches of snow on 10,000 square feet of street on a block, if removed by carts, would be, say, $12.50. The melting process would require that the tarpaulin should be shifted sixteen times to cover the street 200 feet long and 50 feet wide. Making the excessive allowance of 15 minutes for each shifting of the tarpaulin, the street would be melted off in four hours. The cost would depend upon the amount of steam used. That is a difficult matter to calculate, for it would vary according to the temperature of the air and of the snow. The N. Y. Steam Co. charges $1 for 2,000 pounds of steam, which would melt from six to seven tons of snow, and on that basis the steam would cost from three to four dollars per block, and the labor of attendants, etc., probably as much more, say $8 per block, or $160 per mile.

To carry out such an undertaking, even where there are steam mains already laid, would call for a considerable outlay. Steam plugs, like fire hydrants, would be needed on every corner, and each melting would require about 100 to 125 feet of steam hose, capable of sustaining a pressure of certainly over 40 pounds to the square inch, and preferably 80. It is probable that a private company could be organized to do this work. The plan has been successfully operated, and it seems to present a practicable and economical escape from the present disagreeable and dangerous condition of our streets during the winter months.

How to Grow Large Potatoes.

A superb lot of potatoes which was lately exhibited at a French exposition, and considered worth a gold medal, attracted a great deal of attention. The cultivator gave the following as his method of increasing the size of the tuber: When the young stems have attained about four inches in height, all of them excepting two of the central ones are cut away, and these two only allowed to grow. By means of this simple precaution the tubers become much larger than they are in ordinary cultivation.—*Vick's Magazine for December.*

THE GRECIAN ARCHITECTURAL STYLE.*

BY PROF. N. CLIFFORD RICKER.

1. *Building Materials.*—Stone was most commonly employed in Grecian buildings, since it was found everywhere, and it was almost invariably carefully cut and laid dry, without mortar, but with very fine and close joints, sometimes hardly visible. But these joints were good for but a few inches from the exterior, the internal surface of the stone being roughly undercut to save time, though this sometimes caused the joints to flush. The masonry is sometimes very strongly bonded by interlocking the stones, greatly increasing, the cost, though the bonding is frequently neglected, and metallic cramps were used in the more important buildings.

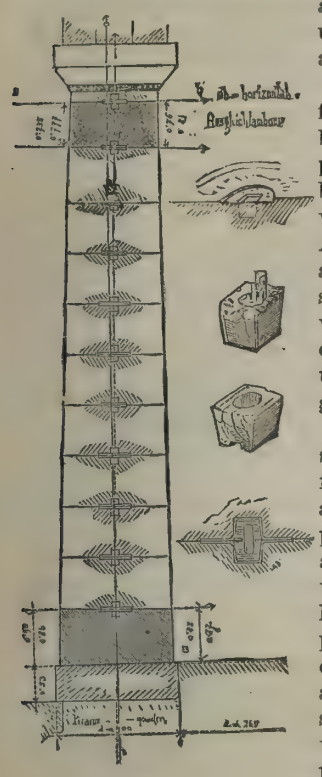


Fig. 1.

Marble was always preferred, when its cost could be met, especially for temples, the favorite variety being the Pentelican, which was quarried near Athens. The Parthenon at Athens was entirely constructed of this marble, which contains a small quantity of iron, causing the surface to take a rich golden tint by exposure.

Limestone was used as a substitute for marble and for ordinary purposes, and as it does not take a good polish, its surface was usually coated with a fine white stucco, very smoothly polished, to give the appearance of marble. This coating was very durable, as it is still found in a good state of preservation, but was rarely of uniform thickness, the surface of the stone being cut with less care than if visible.

Trachyte of a very dark color was used for the Temple at Assos, in Asia Minor, otherwise notable for its unique sculptured architrave.

Pavements, foundations, walls, columns, and cornices, with the occasional exception of the corona, together with the ceilings of the porticoes, were always constructed of stone.

Terra cotta was sometimes employed for decorative purposes, such as the corona or crown moulding of the cornice, a gable rosette, antefixæ, etc., as well as for the tiles of the roof, which were rarely of marble. This material was frequently moulded and also decorated by geometrical or other forms, painted in red and black.

Bricks appear to have never been used by the Greeks.

Wood seems to have always been far from abundant in Greece, and was only used for rafters, and for paneled ceilings having spans too great for construction in stone. Paneled construction appears to have been common in ceilings, the panels being either of wood or terra cotta, decorated by sculptured mouldings, gilding, and painting. In some very ancient temples, rough trunks of trees were employed as columns.

Iron and bronze cramps, set with lead, were used for more strongly binding together the stones in the walls of the most important buildings, as in the Parthenon. Bronze furniture seems to have been common in the temples.

Gold and silver were only used for decorative purposes, though golden shields were sometimes suspended on the architrave of a temple as a votive offering.

Metals were still much too rare and costly to be employed, excepting for decorative or for the most essential constructive purposes.

2. *Method of Construction.*—The general system which forms the basis of Grecian architecture is that of post and-lintel construction, similar to that of the Egyptian temple, but substituting the gable for the flat roof, on account of the greater rainfall. The site of the building was cleared off, leveled, and a solid platform of stone then constructed, slightly larger than the intended structure, with a series of steps extending entirely around it. This was usually covered by large and carefully joined slabs of stone, which formed the floor. On these, the outlines of the plan were marked, and the walls and columns then erected.

The columns were built of drums or short cylinders, closely jointed by grinding with sand, and the external surface was usually cut after being set up, though the upper and lower drums were first finished, to serve as guides for the remainder. These columns supported the architraves, usually composed of three slabs set edgewise, and the cornice, as well as the ends of the rafters (Fig. 1).

The roof was formed of wooden rafters, which supported the edges of the covering tiles, usually of two forms, with ornamental decorations at the ridge and eaves.

Greek construction was excellent, so far as it was intended to be visible; but when concealed, the workmen were often careless, and many faults were permitted which would not be allowed in a modern building under the superintendence of a careful architect. Mortar and concrete were not used.

The Greeks were probably acquainted with the arch, and perhaps also with the vault and dome, but never employed them, preferring the post-and-lintel system, leaving the arched system to be developed by the Romans.

3. *Curvature of Horizontal Lines.*—By some writers, Penrose and Pennethorne, for example, it is asserted that the top of the stylobate and the lower edge of the architrave, as well as the horizontal lines of the cornices, were all slightly higher at the middle than at the ends of the building, thus making these lines curves of very slight curvature, instead of being straight. The reason assigned for this was that the apparent dimensions of the building would thereby be somewhat increased, especially if the observer were placed opposite the center of one side, and that this would also correct any tendency of a straight line to appear depressed at its center. It is evident that this would materially increase the cost of the building and the care and labor required in its erection. The triglyphs and metopes would not be truly rectangular, but slightly trapezoidal.

It is found that the centers of the sides of the stylobate of the temple of Theseus at Athens are now from one and five-eighths to two inches higher than the angles, these sides being 104 and 45 feet long. But the angles of this stylobate are not all in a common plane, and there are also many other slight inaccuracies in construction, so that after a careful examination and measurement of the building in 1879, Professor Durm decided that there was no ground for the curvilinear theory, and that the differences observed were due to carelessness in the erection of the building, to unequal settlements, or to injuries during the centuries which have elapsed since its completion.

4. *Polychromy.*—Previous to the publication of Hittorf's work, in 1851, it had been assumed that Grecian temples, being either constructed of white marble or coated with white stucco, were not externally decorated by color. But a close examination of the examples still remaining showed that a large part of the exterior was actually painted with bright and full colors. Also, that some portions of the statues and reliefs were colored, though it appears probable that these were only partially colored, the drapery and the background being painted to accent the outlines of the figures and afford a stronger contrast.

Full and pure colors were employed by the Greeks, such as blue, red, green, yellow and gold, with brown and black for pottery, and pink, light green, and violet for the draperies of statues. These were sometimes opaque, sometimes applied as transparent glasses, and were frequently encaustic, or prepared with wax as a vehicle.

The walls of the cell of the temple, the columns, the architrave and cornice, were either unpainted or were of a clear orange yellow tint. The abacus of the capital was red, decorated by a gilt band of fret ornament. The echinus was dark green, its leaves outlined with red and gold, with deep red annulets. The under surface of the architrave was ornamented by guilloches; its outer surface by inscriptions in gold and metallic shields or scroll ornaments. The guttæ were gilded. The triglyphs were blue with gilt ornaments, and the ground of the metopes was a deep brown, while the reliefs were sometimes fully and sometimes partially painted in their natural colors. The bed mouldings were gold or green and red. The ground of the lower surface of the geison was vermilion, with mutules of blue and gold ornaments. The vertical surface of the geison was ornamented by leaf

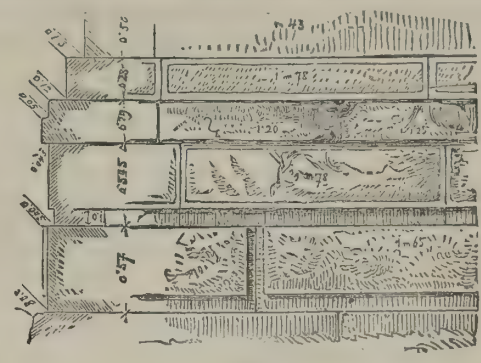


Fig. 2.

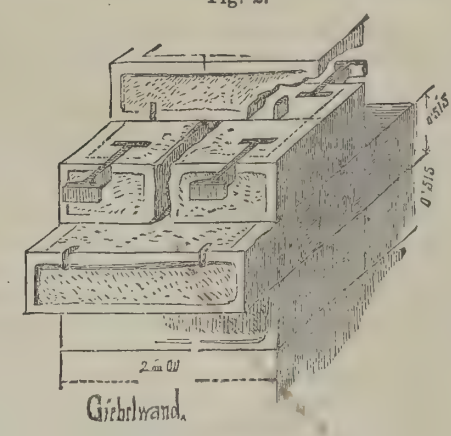


Fig. 3.

ornaments in green and red, and a gilt honeysuckle ornament decorated the corona. The ground of the tympanum was brown, with statues sometimes of the natural colors. This applies to the Doric order.

The exteriors of Ionic and Corinthian buildings were similarly [illegible] excepting that a large proportion of the de[illegible] instead of being merely p[illegible] hollows and gild[illegible] usually [illegible] of the exterior.

Hittorf published a colored rest[illegible] temple, and an imperfect attempt was made to [illegible] this arrangement of colors in the entrance hall of the United States Patent Office, but the colors and their arrangement are not approved by modern artists and connoisseurs, and it has seldom been employed. Either our preference for mixed, broken, and more quiet coloring is erroneous, the result of inferior taste, or the Greeks never succeeded in the use of color so well as in that of form. It is possible that Grecian temples were not painted when originally built; that this was done under the Roman Empire, or later.

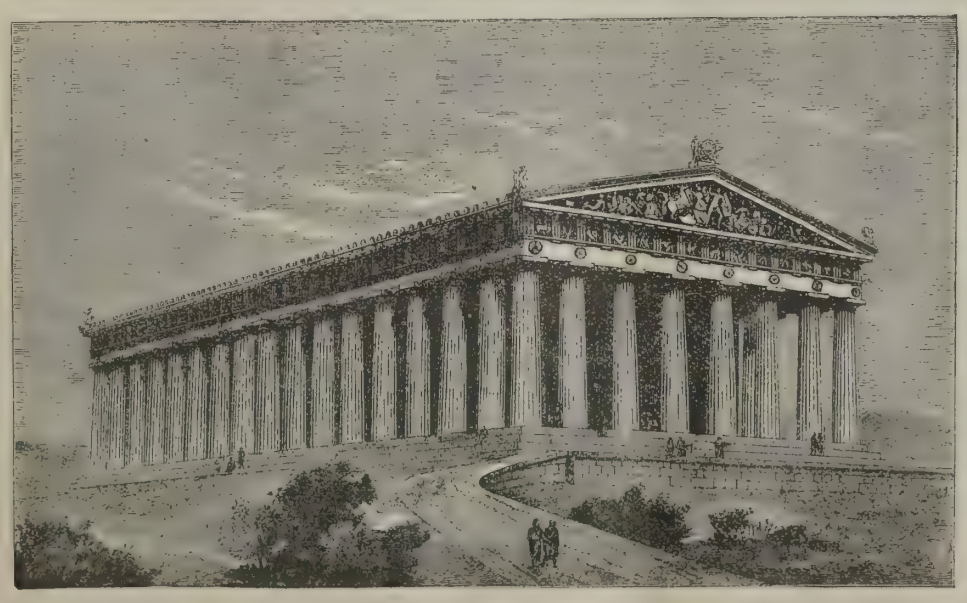


Fig. 4.—THE PARTHENON.

5. *Walls.*—These were always built of large blocks of stone with dressed beds and joints, the face being sometimes left rough in terrace walls (Fig. 2), sometimes having draughted margins, but always smoothly cut in important buildings. Great care was taken to obtain fine and close joints, mortar never being used, nor was the interior of the wall ever composed of a concrete of stone spalls and mortar, as in modern building. Cyclopean masonry was rarely used, and notched stones are not common, the rectangular ashlar being most frequently employed. The wall was two-faced, the courses of the sides not always corresponding, and often merely resting against each other or connected by metallic cramps, though through bond stones are sometimes found (Fig. 3). No separate and proper foundation was provided, but the wall stood on the stone pavement of the building. The thickness of the walls of Doric buildings was about one-tenth their height, and usually diminished from bottom to top, the external surface therefore being slightly inclined inward. This batter amounts to 4⅝ inches for a height of thirty feet in the walls of the Parthenon. This was probably done to better accord with the columns, which were always considerably diminished. their axes also being sometimes inclined inward. Walls of buildings in which the Ionic order was used were never battered,

* The figures are taken from Durm's "Griechische Baustyle;" Lubke's "History of Architecture," Vol. I., sixth edition; and Mauch's "Architektonische Ordnungen."—*Building.*

and were thinner, their thickness being about one-twelfth their height.

6. *Roofs.*—The roofs of Grecian buildings were never flat, nor were they ever ornamented by proper windows, forming a prominent architectural feature of the building, though simple openings for the admission of light probably frequently existed in some form. They were decorated by acroteria, placed at the apex and ends of each pediment (Fig. 4).

The term pediment is applied to the horizontal and the two inclined cornices at the end of a Grecian building, together with the triangular wall surface included between them, which is called the tympanum.

The principal forms of Grecian roofs were the following:

A. The gable or pediment roof, always used for temples, and composed of two plane surfaces. This was constructed of wooden rafters, spaced to support the edges of tiles of terra cotta or, rarely, of marble. No trusses were used. The tiles were of several kinds, but generally consisted of broad tiles with their edges turned up, which were covered by overlapping narrow tiles. Ornamental palm leaf forms, called antefixæ, were added to these covering tiles at the eaves and the ridge of the roof. There was no gutter to receive the water, which dripped from the edge of the roof (Fig. 5).

B. The pyramidal terraced roof, as in the tomb of Mausolus, constructed of stone steps, with a quadriga at top.

C. The conical roof was employed for circular buildings, which are very rare in Greece, and was constructed like the gable roof, though trapezoidal tiles were required.

D. The conical stone roof of the Monument of Lysicrates was unique, consisting of a single large slab of stone, hollowed out beneath the upper surface, being decorated by scale-like forms, perhaps suggested by pine cones. A central ornament supported a bronze tripod.

7. *Mouldings.*—These afford some of the most striking and valuable characteristics of the style, since the Greeks appear to have first appreciated the beauty and effect of mouldings, singly and in combination with other architectural details.

The *profile* of a moulding is the outline of its cross section. A moulding may be generated by moving its profile in either of two ways:

1st. Along a straight line, producing *rectilinear* mouldings.

2d. Along a circle, or by rotation about an axis, producing *annular* mouldings, used only for capitals and bases of columns.

Grecian mouldings possess some very distinctive characteristics, thus serving to readily distinguish the style from all others:

A. Some unique forms of mouldings are employed, as the hawksbill, etc.

B. Profiles of mouldings are rarely circular arcs, but are usually portions of ellipses, hyperbolas, parabolas, etc. (Such profiles are employed in no other style, excepting imitative Grecian.)

C. The outlines of the ornaments painted or sculptured on the surface of the moulding are generally similar to the profile of the same moulding. It is usually the case that only the surfaces of alternate mouldings are thus decorated, the others being left plain, with the exception of the astragal, which is almost always ornamented.

D. The mouldings of the caps and bases of antæ or pilasters are almost invariably very different from those of circular columns, in profile, arrangement, and decoration. (In Roman and later styles these are generally similar.)

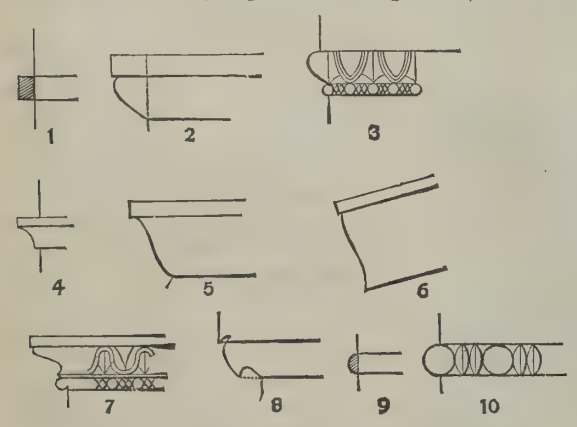


Fig. 6.

In early Grecian buildings, the decorations were merely painted on the surface of the moulding; in later, especially in connection with the Ionic or Corinthian orders, they were usually sculptured in low relief.

More complex profiles were probably preferred to circles for Grecian mouldings, because the gradation of the shading and shadows would be more delicate and beautiful, thus harmonizing better with the architecture. This became evident when executed in white marble, though this refinement would be useless if a dark stone were employed. The cost was thereby considerably increased.

The principal forms of mouldings were the following:

A. *Rectilinear* (Fig. 6).

1. *Fillet.*—Profile rectangular. Also a flat surface used for separating two curved surfaces or to terminate a moulding.

2. *Ovolo.*—Profile convex, usually a little more than half an ellipse, parabola or hyperbola, whose axis is horizontal. Most curved at top and separated from the fillet by a deep quirk. Sometimes used as a corona, more frequently as one of a group of mouldings.

3. *Egg and Dart.*—Simply a sculptured ovolo. Rare in the Doric order, but very common in the Ionic.

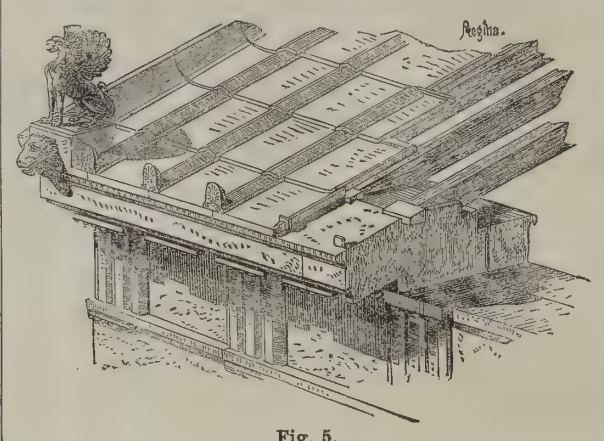


Fig. 5.

Frequently used in combination with the beaded astragal.

4. *Cavetto.*—Profile similar to that of the ovolo, but concave instead of convex. Rare, used as a corona or to form a group.

5. *Cyma Recta.*—Composed of a cavetto and ovolo tangent to each other, the former always being uppermost. Chiefly employed as a corona, for which purpose it is still used, this special section of moulding now being generally termed "crown mould."

6. *Cyma Reversa.*—Composed of an ovolo and cavetto, the ovolo being uppermost, making the profile the reverse of that of the cyma recta. Sometimes used as a corona, but more frequently as a bed moulding, etc.

7. *Lesbian Cyma.*—Composed of a cyma reversa above a beaded astragal, both always being sculptured. Or it might be considered as being an egg and dart moulding and beaded astragal, the lower portion of the first being concave instead of convex. Very frequently used as a bed moulding, also to separate the frieze and architrave of the Ionic and Corinthian orders.

8. *Hawksbill.*—Probably composed of intersecting ovolo and cavetto, usually with a necking and one or more fillets beneath it when used in the capitals of antæ. Common in capitals of antæ, also sometimes found in cornices, forming a drip moulding,

9. *Astragal.*—Profile usually semicircular if small, or semi-elliptical if large. Not common as a plain moulding.

10. *Beaded Astragal.*—Profile like that of the astragal, excepting that it sometimes forms three-fourths of a circle; decorated by being cut into alternating oblong beads and pairs of disks, connected by a kind of stem. This moulding was a favorite, and was much used in composing groups of mouldings, etc.

B. *Annular Mouldings.*—(Fig 7.) Only employed for the caps and bases of circular columns.

1. *Fillet.*—Profile like that of straight moulding and used for the same purposes. The name is also applied to the narrow strips of the original surface of a column, left between the flutes of the Ionic and Corinthian orders.

2. *Incision.*—Merely an angular notch separating the capital and shaft of a Doric column. Two or three incisions are usually grouped together.

3. *Annulets.*—Annular mouldings of peculiar profile, a group of 3, 4, or 5 being placed between the echinus and necking of the Doric capital.

4. *Echinus.*—Profile like that of the ovolo; usually decorated by painted leaves with their points downward, or by sculptured ornaments similar to those of the egg and dart moulding. This is the principal moulding of the Doric capital, just beneath the abacus.

5. *Cavetto.*—Similar to the straight cavetto.

6. *Scotia.*—Profile concave, but comprising a larger portion of the curve than the cavetto; employed only on the base of a column, usually between two toruses.

7. *Torus.*—Profile convex, usually semi-elliptical; decorated either by shallow horizontal flutes or by sculptured interwoven bands. The lowest moulding of the base.

8. *Apophyge.*—A concave surface of quadrant profile, which is used to connect the capital or base of a column with its shaft.

9. *Beaded Astragal.*—Like the straight moulding, and generally placed between the necking and shaft of Ionic and Corinthian columns.

10. *Astragal.*—Profile semicircular, surface plain; sometimes found in the Ionic base.

8. *Columns and Antæ.*—Grecian columns are always circular, and are also free, *i. e.*, are very seldom attached to a wall; antæ are pilasters of rectangular section, which frequently terminate the side walls of temples.

The antæ were built of courses corresponding to those of the adjacent walls, but the columns were composed of cylindrical drums of stone, so cut as to bear only on their outer edges. A square hole was sunk at the center of each end of a drum, which was filled with a tightly driven block of wood. A round wooden pin in the middle of this block then connected two drums and also formed a center, around which the upper drum could be rotated while grinding the joints with sand. Only the capital and lower drum were cut before setting up the column, the others being rough. The outline of the shaft could then be made curved or straight as desired, by using a wooden template, the flutes laid out and worked with much greater ease and certainty than if the column had been completely finished before setting. (See Fig. 1.)

Diminution of Columns.—All Greek columns were diminished, *i. e.*, were smaller just below the capital than at the lower end of the shaft. This diminution was greatest in the early Doric buildings, but was gradually lessened as the ratio of height to diameter was increased. It varies from one-third to two-fifteenths of the lower diameter of the shaft, being in the best examples about five-twenty-fourths for the Doric and one-sixth for the Ionic and Corinthian orders.

Doric antæ were necessarily diminished, since the walls were battering, but they were plain and not fluted.

Entasis of Shaft.—The vertical outline of the shaft of a Grecian column was rarely straight, but was usually slightly curved and convex. This is the *entasis*, which was usually quite small, though materially affecting the appearance of the column. The shafts of the external columns of the Parthenon are 27½ feet high, and their curvature is such that their middle diameter is $\frac{5}{8}$ inch more than if the outlines were straight, about $\frac{1}{120}$ part of the lower diameter of the shaft, making an entasis of only $\frac{5}{78}$ inch. The probable object of this entasis was to prevent the outline of the column from appearing concave. The curve of the entasis may have been circular, though it appears more probable that it was a portion of some higher curve, since the mode of working equally permitted the use of any plane curve.

Proportions of Columns.—The ratio between height and lower diameter of shaft was least in early Doric columns, but was gradually increased. It was at first 4, then 6 in Doric columns of the best period, from 9 to 10 for Ionic, and from 8·8 to 10·7 for Corinthian columns. These ratios are all smaller than those employed in modern architecture.

Inclination of Columns.—Their axes were rarely exactly vertical, but were slightly inclined toward the building, to increase its apparent strength; the angle columns were inclined more, because on two sides. To further increase this effect of stability, the angle columns were usually a little larger than the intermediate columns.

Intercolumniations or Spacing of Columns.—The angle column and triglyph of a Doric building were both set close to the corner; the centers of all other columns were set under the centers of each alternate triglyph, or rarely under each third triglyph. This made the intercolumniation next the angle less than the others, thus further increasing the apparent stability of the corner. But the position of each column was rigidly fixed, once the diameter of the shaft and number of columns had been decided. The distance between centers of columns was generally 2·6 diameters. (See Fig. 2.)

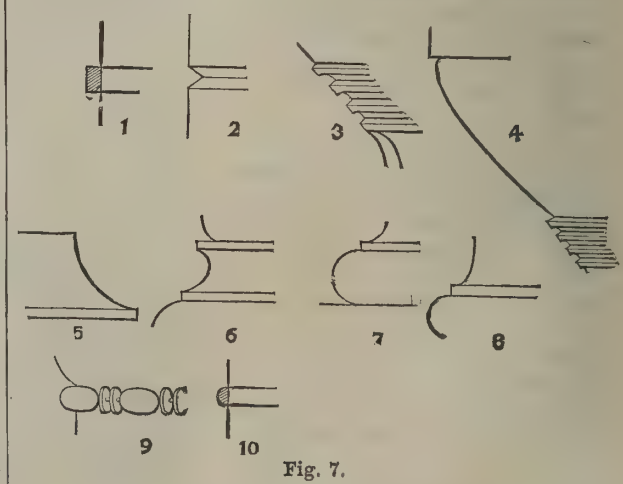


Fig. 7.

Since the frieze of the Ionic or Corinthian order was not divided into triglyphs and metopes, these columns could be set as desired, through necessarily equidistant. Distances between centers vary from 2½ to 4 diameters.

A NEW METHOD OF GLAZING SASH.

BY PETER HENDERSON.

It is well known that all glass now (both in portable sashes and in fixed greenhouses) is simply embedded in putty, and kept in place by glaziers' points, no putty being now used on top, as was formerly done. It has been found that when the glass lies on the sash bar thus embedded, the putty soon rots or wears out, and water gets in, and not only loosens the glass, but rots the bar as well. A most simple plan to obviate this is to pour along the junction of the bar with the glass a thin line of white lead in oil, over which is shaken dry white sand. This hardens, and makes a cement that effectually checks all leakage. It is quickly done. Our engraving shows how the portable sash is held, and the application made from the oil can containing the thin white lead. I have seen glass, so cemented, that has stood for ten years,

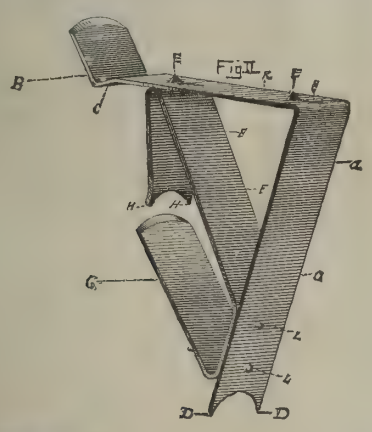
IMPROVED METHOD OF GLAZING.

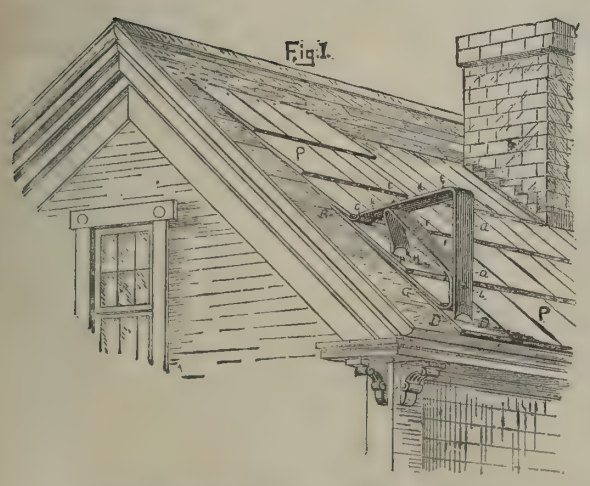
still in perfect order, and it looked as if it would stand for ten years more without further repair. This plan, which is but little known as yet, is of the greatest importance; had I known of it thirty years ago, I would have saved many thousands of dollars in repairing, besides having the plants under this watertight glazing in better condition.—*American Agriculturist.*

NEW ROOFING OR STAGING BRACKET.

BY HENRY E. TOLMAN, SHELBURNE, MASS.

To use this invention, the bracket is grasped so that the projection, B, is pointed toward the ridgepole of the roof. The projections, B and G, are then forced or pushed under the shingles until the shoulder, C, rests against the base of the shingle under which the projection, B, is placed. This brings the spurs, H H and D D, so that the same rest upon the roof, and thus, after two or more are placed in their proper position,





NEW ROOFING OR STAGING BRACKET.

my brackets are ready to support the boards or staging, as shown.

Adamant—A New Invention.

Prof. Carl Straub, of Syracuse, N. Y., has invented a new cement or artificial stone, for which he has obtained a patent. By years of patient study and experiment, he has produced a material which is believed to be of value, especially to the building trade. His production, with various changes, can be used for wall plaster, for tiles and flooring, plastic work, artificial marble, and granite. He has given the name of "Adamant" to the wall plaster, and "Chromoleth" to the finishing material, either white or colored. It is prepared ready for use by simply mixing with water and applied in the usual manner.

It is a chemical composition, and in a few hours after being applied it is said to become hard as marble, and capable of resisting intact all the ordinary casualties that prove so destructive to common plaster.

Among many other advantages, the inventor says adamant saves time and labor; it can be applied as well in winter as in summer; it avoids saturating the timbers with water, and the consequent warping and shrinking; it saves waiting weeks for the rooms to dry out, and they can be safely occupied next day after finishing.

It adheres equally well to lath, brick, or iron, and will last as long as the building.

Carpenters need not move out while the plastering goes on, but can work right along on the same floor with the plasterers.

Adamant will not crack or shrink; rats will not gnaw through it, nor will it harbor vermin, noxious gases, or germs of disease, like common plaster, because it is smooth, dense, and hard, instead of porous. It places much less weight on the building than plaster, and instead of being a dead weight, it contributes strength. It can be treated with any desired finish.

The Bee's Sting a Useful Tool.

A new champion has arisen to defend the honey bee from the obloquy under which it has always rested. Mr. Wm. F. Clarke, of Canada, claims to have discovered, from repeated observations, that the most important function of the bee's sting is not stinging. In a recent article he says:

My observations and reflections have convinced me that the most important office of the bee sting is that which is performed in doing the artistic cell work, capping the comb, and infusing the formic acid by means of which honey receives its keeping qualities. As I said at Detroit, the sting is really a skillfully contrived little trowel, with which the bee finishes off and caps the cells when they are filled brimful of honey. This explains why honey extracted before it is capped over does not keep well. The formic acid has not been injected into it. This is done in the very act of putting the last touches on the cell work. As the little pliant trowel is worked to and fro with such dexterity, the darts, of which there are two, pierce the plastic cell surface and leave the nectar beneath its tiny drops of the fluid which makes it keep well. This is the "art preservative" of honey. A most wonderful provision of nature, truly! Herein we see that the sting and the poison bag, with which so many of us would like to dispense, are essential to the storage of our coveted product, and that without them the beautiful comb honey of commerce would be a thing unknown.

If these things are so, how mistaken those people are who suppose that a bee is, like the Prince of Evil, always going about prowling in search of a victim. The fact is that the bee attends to his own business very diligently, and has no time to waste in unnecessary quarrels. A bee is like a farmer working with a fork in his hay field. He is fully occupied, and very busy. If molested or meddled with, he will be very apt to defend himself with the implement he is working with. This is what the bee does; and man, by means of his knowledge of the nature and habits of this wondrous little insect, is enabled, in most cases, to ward off or evade attack. It is proof of their natural quietness, industry, and peaceableness that so many thousands of them will go through a summer of ceaseless activity close to your dwelling house, and perhaps not half a dozen stings be inflicted during a whole season.

Paris Cement.

A new cement, called "cement de Paris," has been introduced in France, the inventor and manufacturer of which is M. Vallin, the director of a French cement works, the Gypserie de la Gare. The new material is stated to be at least equal, if not superior, in quality to the English article, while it can be sold at the rate of 2s. 6d. to 5s. per cwt. This material is said to possess durability and the cold appearance of marble, and a wall rendered, floated, and set with it becomes impermeable to moisture. It can also be polished, and made to present an elegant appearance. In the usual method of manufacturing cement, it is generally found very difficult to obtain a thorough burning of every piece of clay or stone; sometimes the surface of it is burnt too much and the center too little or not at all. The result is that, after the clay or stone is crushed, it contains a considerable quantity of unburnt grains, which play the role of an inert material, and which people pay for as cement. In order to avoid this unequal burning, M. Vallin, instead of crushing the material after, does so before placing it in the kiln. A crushing mill breaks it into small pieces, which are automatically conveyed to a vertical cylinder mill, whence they issue ground to powder. This is in turn again automatically placed on sieves, which shift it into pans or kilns heated by gas. A series of inclined plates, having a gyratory motion, agitate the powder in each of the pans, and thus render every particle of it amenable to the action of heat. Finally, a mechanical arrangement conveys it to sacks, which a man fills as the powder arrives. The whole operation is thus continuous and automatic, which of itself is a great advantage. But still more important and appreciable is the fact that all the particles of the cement are thoroughly burnt. M. Vallin estimates that his method enables him to effect a saving of about 30 per cent over those ordinarily adopted. Besides the homogeneity of the particles, the other advantages claimed for this cement are its great whiteness of color, durability, and freedom from liability to unequal shrinkage, which causes fire cracks.

COMBINED HAMMER AND PLANER.

BY CHARLES F. BRENT AND ALFRED LANG, OF MOUNT VERNON, O.

In fitting up siding, cornice, and casings, and for various other work, our improvement is of advantage,

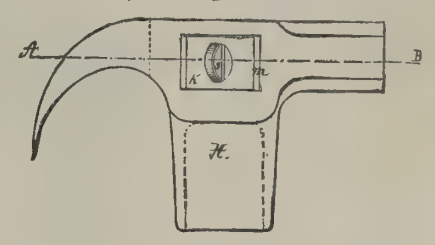
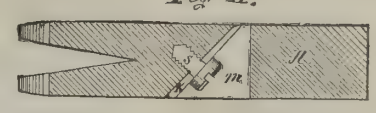


Fig. II.



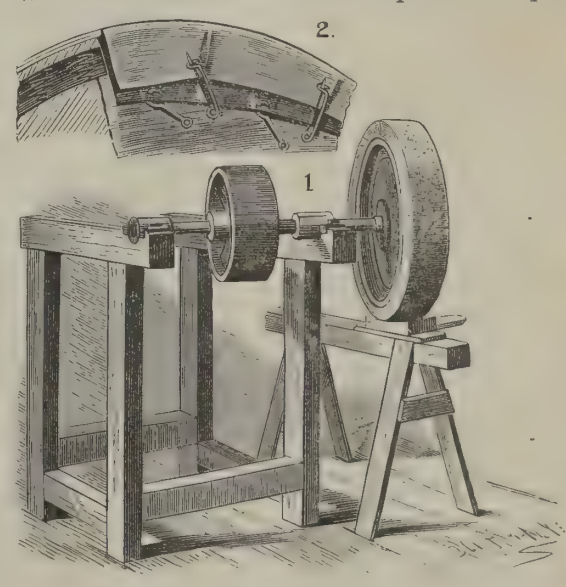
COMBINED HAMMER AND PLANER.

for in case a board after being sawed does not fit, it may be planed, and thus made to fit, by our combined hammer and plane, thus avoiding the trouble of carrying a plane specially for that purpose.

The hammer, H, is provided with an opening, *m*, which extends from side to side, and the rear wall of this opening is inclined and forms a bed for the bit, K, which is secured thereto by the set screw, S. The front wall is straight or at right angles to the sides or longitudinal center of the hammer. A throat is thus formed through the body of the hammer from side to side, which is contracted at one end and widened at the other end. The edge of the bit projects through the contracted end of the throat, and the butt or heel is located within the widened end.

SANDPAPERING AND POLISHING MACHINE.

The accompanying engraving illustrates a sandpapering and polishing machine, which is the invention of Mr. T. B. Marshall, of Sidney, Ohio. With this machine either a flat, oval, or concave surface can be sandpapered and polished with the grain of the wood. To the peripheral face of the wheel, which is of any suitable size, say 24 inches, are secured springs shaped as shown in Fig. 2, and placed as close together as possible. A band of felt is placed about the springs and held in position by a strip of sacking or canvas, the edges of which are corded. This strip is held in place



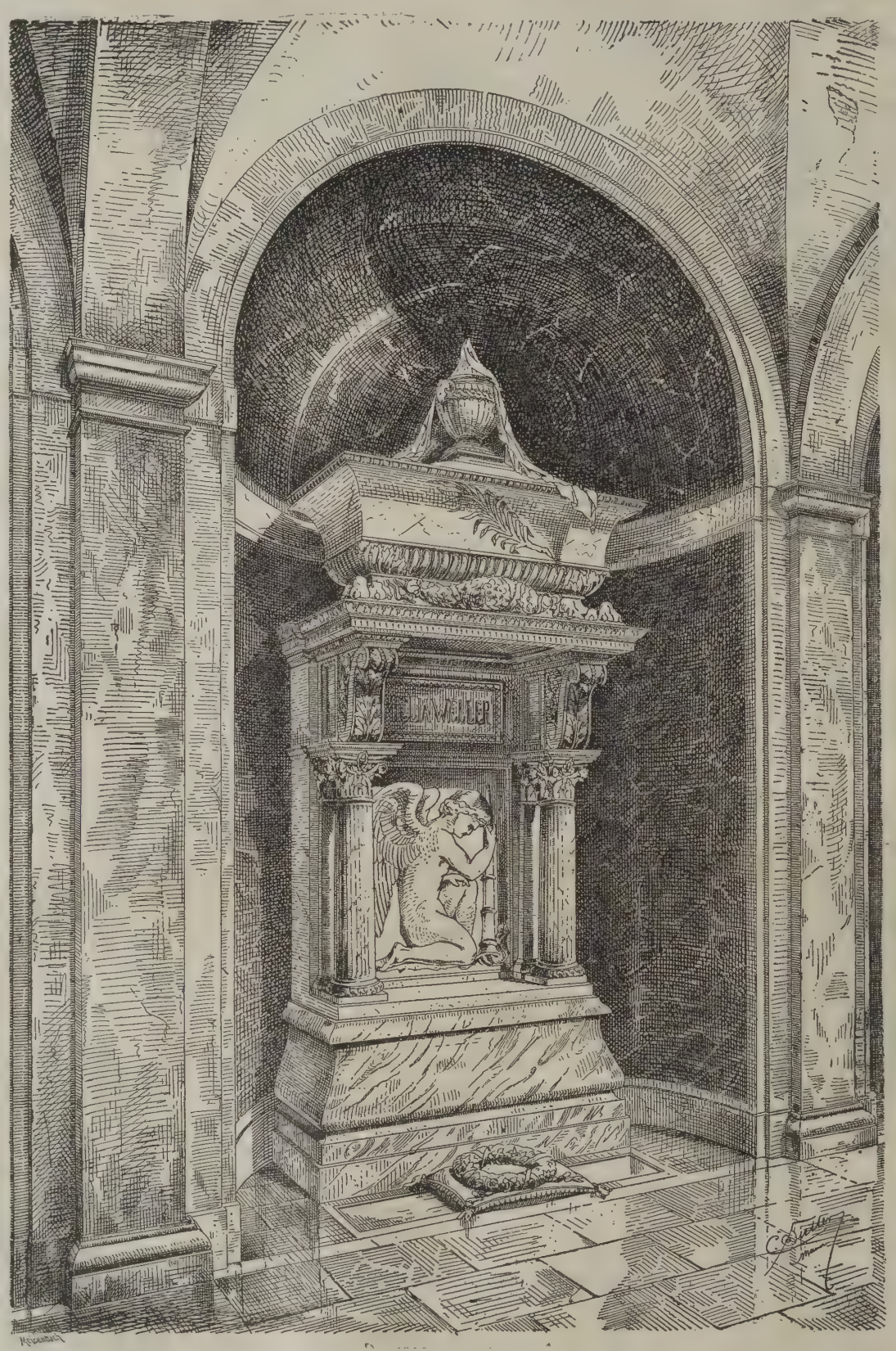
MARSHALL'S SANDPAPERING AND POLISHING MACHINE.

and prevented from creeping by hooks secured to the side of the wheel by nails. The sandpaper is applied so as to rest smoothly upon the peripheral surface of the wheel, the edges being bent over and crimped and secured to the sacking by safety pins. The wheel is mounted upon a shaft driven in any convenient way. The work to be smoothed and polished is pressed against the surface of the rapidly revolving wheel. This machine has been practically tested, and has given most satisfactory results.

AN attempt to smoke out a 'coon resulted in the burning of a thousand acres of timber land in New Hampshire.

DESIGN FOR A TOMB.

This design is presented in the hope that it may contain useful suggestions for those of our readers who have occasion for work of this nature. The illustration is from *Architektonische Rundschau.*



A TOMB IN BOLOGNA.—DESIGNED BY EISENLOHR & WEIGLE ARCH. STUTTGART.

Home Furnishing.

A writer for the Household Department of the *Cosmopolitan* thus pleasantly chats about home furnishing and decoration:

There is an individuality that attaches itself to every home. Fashion and custom, it is true, assert themselves in the furnishing, but the touch that makes one home different from another is that of the woman who reigns there. The love of order or of comfort is quite as apparent on entering some houses as in others, the eye for color that has placed a drapery of olive here or a scarf of garnet there, so that our homes may well be said to be the expressions of our feelings. And in this age of beautiful colors, of fabrics within the reach of all, there seems to be no excuse for unattractive surroundings.

In furnishing a house, be it large or small, it is well that the hall, which affords the first glimpse we have of the interior, should have an air of welcome. This can easily be maintained if the hall has breadth, and need not be entirely lost sight of in the narrower halls. The coloring in halls should be rich, and the light subdued. If gas is used, let the globes of the fixtures be of deep coloring—the olives, deep red, and orange. These all make good tints, and combinations of them are delightful. In broad halls with high ceilings, tapestry hangings and heavy pieces of metal work are beautifully decorative and in good keeping if the house is large. If the hall has unusual breadth, an open fireplace is desirable, especially in the country house, as there the hall may have a domestic air.

If the hall is very narrow, and the stairs near the front door, it will prove to be an obstinate affair. Portieres can be hung under the casings of the doors; and if it has a vestibule entrance, and the inner doors have glass panels, shirrs of soft China or India silk, figured or plain, will help to furnish. If there are double doors and only one is to be open at a time, there may be space in the corner for a small stand and a large vase or bowl of flowers. In such a hall the hat rack should not be the prominent feature. A small one is much more attractive.

The expanse of a long drawing room may be relieved by a cozy grouping of chairs and tables in the front, and perhaps a desk and piano, and thus leave the lower end for the more secluded *tete-a-tete.* If the piano is an upright, it will break the length of the room by being drawn out at a slight angle from the wall, and a scarf in light material thrown over it, not festooned. Square parlors are much more homelike, and better suited to people of moderate means. The light being usually stronger, the effect of color is more apparent. A room finished in cherry, or with wood painted dark red, may be papered with olive slightly blended with light blue, and a deep cream ceiling. One painted in dark green may have the same shade in paper, with a frieze of salmon, and a garnet ceiling. The same colors may predominate in the rugs. Madras curtains are in good taste in small parlors, with or without heavier ones.

The tone of the dining room should be warm and genial; that which comes through the rose stained upper sashes of windows, or chandeliers, or by means of candles with small red shades, is soft and pleasing. Where there is no stained glass, a very good effect is gained by a sort of patchwork, contrived with the decorated pieces of crinkled Japanese material that are found in almost all the fancy stores nowadays. They are about five by seven inches in size, brilliant in coloring, and, when put together with satin ribbons two inches wide, of any color desired (deep red or purple perhaps), and tacked securely to the casing of the window, the result is marvelously pretty.

The dining room, of all rooms in the house, should be comfortable. An Oriental couch, without ends, and with big pillows at the back, may afford an after dinner rest, and easy chairs on each side of the open fireplace give an opportunity for a half hour with the morning paper, or a snug corner to plan the day's work. It is unfortunate to load the room with decorative china and tiers of plaques, and a great display of silver is vulgar.

The beautiful colors that are brought out in the heavy materials are repeated in goods of lighter weight. Silesias and sateens come in every possible shade and color, and the heavier sateens, such as upholsterers use to line heavy draperies, make in themselves attractive hangings. These can be trimmed with the small tassel fringe. This cannot always be purchased in the shade desired, but any woman with deft fingers can make it at odd moments, by forming tassels about one and one-half inches long of crewels, and crocheting a tiny border to hold them together, which can be sewed to the edge of the curtain.

How to Darken Oak.

A correspondent in the *English Mechanic* gives the following process of treatment, which he considers the best, after trying the various other processes used by builders and cabinet makers to darken woods: "Oak is fumigated by liquid ammonia, strength 88°, which may be bought at any wholesale chemist's at 5s. a gallon. The wood should be placed in a dark and airtight room (in a big packing case, if you like), and half a pint or so of ammonia poured into a soup plate, and placed upon the *ground* in the center of the compartment. This done, shut the entrance, and secure cracks, if any, by pasted slips of paper. Remember that the ammonia does not touch the oak, but the gas that comes from it acts in a wondrous manner upon the tannic acid in that wood, and browns it so deeply that a shaving or two may actually be taken off without removing the color. The depth of the shade will entirely depend upon the quantity of ammonia used and the time the wood is exposed. Try an odd bit first experimentally, and then use your own judgment."

Brick Pavements.

Within the past few years, several towns in the Western States have been experimenting with street pavements of brick. Many miles of brick pavement, it is needless to say, exist in Holland, and, if we are not mistaken, there are remains of brick in the streets of Nantucket, but elsewhere in the United States this material has been rarely, if ever before, used for the purpose. According to the *Engineering News*, Bloomington deserves the credit of being the first modern town in this country to introduce brick paving on an extensive scale. The town is situated in a clay region, and bricks are cheap there, as well as good, and by careful selection of material it has been found possible to produce bricks so tough and hard that in Bloomington, where seven miles of streets are now laid with them, they have been found, after ten years' experience, durable, as well as cheap and convenient. In Amsterdam, where, although canals intersect the city in all directions, a good deal of traffic is carried on by means of horses and wagons, the pavements of small, whitish bricks show little sign of wear, and, partly on account of their porosity, and partly from the numerous joints which exist between them, they are in wet weather much drier and pleasanter to walk over than stone, or even asphalt. In the Illinois town, the street is prepared for paving by forming the natural surface into the proper profile; on this is then laid four inches of coarse sand or cinders, evenly spread, cinders being preferred on account of the better drainage which they afford, and the whole is covered with bricks laid flat with joints as close as possible, and accurately formed to the desired profile. Fine sand is then spread over the surface, and worked well into the joints with a broom, and, after laying an inch more of sand over it, the top course, consisting of bricks on edge, is set, as closely as possible, and the joints of this also well filled with sand. The multiplicity of joints makes the pavement easy and safe for horses to travel over, and the whole cost is only from one dollar and forty cents to one dollar and eighty cents per square yard.

How to Measure Bridge Deflection.

A novel method of measuring the deflection of railway bridges has been tried in Russia. An iron pipe, 1½ in. in diameter, was carried along the outside of one girder. From this pipe, at each abutment at the pier, and at five intermediate points on each span, vertical pipes of the same diameter branched out. Inside, and near the top of each vertical pipe, was fixed a graduated ¾ in. glass tube, the iron pipe being cut away on both sides. The zero divisions on the tubes were all the same distance above the flange of the girder. Before the bridge was loaded, the apparatus was filled with water, the tops of the upright pipes covered over, and the water was then drawn off until it stood at zero in each gauge. On the bridge being loaded, the deflection could be read with ease.

CARVED DESIGN IN BOXWOOD.

Our engraving shows an etching recently given in the London *Architect*, representing a barometer and thermometer holder. It is one of Champollion's works. Those who are looking for graceful ornamental lines may find something useful in this design.

BAROMETER AND THERMOMETER IN CARVED BOXWOOD.

A Lumber Roller.

Some genius about a planing mill has invented a device for unloading the wagons on which the lumber is hauled for dressing, which is so simple and practical that it is a wonder, as it usually is in such cases, that it was not thought of before. The platform on which the lumber is ordinarily piled as it comes into the mill is raised to just about the height of a wagon, so that, as the load is backed up, the rear end projects over it. A slight depression in the roadway, just in front of the platform, permits the wagon to drop a few inches, and allows the weight of the load to rest upon the edge of the platform. Close to this edge, a live roll is placed, which is given a positive motion by a link belt connection, and behind it are put ordinary dead rolls at suitable distances. The operation of the device will be apparent without further explanation. As soon as the load of lumber rests upon the live roll, it begins moving into the mill, seemingly of its own accord; and sooner than a half dozen boards could be removed from the load by hand, the entire jag is quietly rolled into the mill without handling. It is best to place rollers on the wagon also, in order to make the load move easily and promptly as soon as it rests upon the live roll. To a planing mill operator doing a large business, and who is compelled to employ a number of men and teams to handle the lumber that comes in to be dressed, the value of this little device will be perceived at a glance. The saving in time makes it possible to do the same amount of work with a less number of teams, and with a notable economy of labor for the teamster. It has been applied to the new mill of the Ludington, Wells & Van Schaick Company, at Menominee, Mich., where an ordinary six inch wrought iron pipe, polished, is used for the live roll, being connected with the line shaft with suitable belts and pulleys to secure the proper speed. The beauty of the arrangement is that it is not patented, and may be used by any one. It is said to have been invented by a man at Eau Claire, who certainly deserves the thanks of the planing mill fraternity for his ingenuity.—*Timberman.*

Cleaning Waste Pipes.

A correspondent of the *Am. Artisan* says: The annoyance arising from the stoppage of waste pipes in country houses, although very great, is but a small matter compared with the dangers which may follow obstructed pipes. The "sewer gas" about which so much has been written, and which is so justly dreaded, is not, as many suppose, the exclusive product of the sewer. Indeed, the foulest, most dangerous and deadly gases are not found in sewers themselves, but in the unventilated waste pipes and those which are in process of being clogged by the foul matter passing through them. Any obstructions in the soil or waste pipes are therefore doubly dangerous, because it may produce an inflow of foul gas into the pipe, even though the entrance to the sewer itself has been entirely cut off.

The question is how to get rid of the accumulations in pipes partly stopped or already closed. Digging up and cleaning out is a costly remedy, often ineffectual by reason of careless workmen. The second is the plumber's force pump, which is usually only a temporary relief.

In pipes leading from the house to the cesspool there is a constant accumulation of grease. This enters as a liquid and hardens as the water cools, and is deposited on the bottom and sides of the pipes. As these accumulations increase, the waterway is gradually contracted till the pipe is closed. When the pipe is entirely stopped, or allows the water to fall away by drops only, proceed thus: Empty the pipe down to the trap, as far as practicable, by "mopping up" with a cloth. If water flows very slowly, begin when the pipe at last emptied itself. Fill the pipe up with potash, crowding in with a stick. Then pour water upon it in a small stream, stopping as soon as the pipe appears to be filled. As the potash dissolves and disappears, add more water. At night a little heap of potash may be placed over the hole and water enough poured on, so that a supply of strong lye will flow into the pipe during the night. Pipes that have been stopped for months may be cleaned out by this method, though it may call for three or four pounds of potash. The crudest kind, however, appears to act as well as the best. If the pipe is partially obstructed, a lump of crude potash should be placed where water will drip slowly upon it and so reach the pipe. It is also well to fill the upper part of the pipe with the potash, as before, and allow hot water to trickle upon it. Soda and potash are both used for the purpose of removing greasy obstructions, and the usual method of application is to form a strong lye and pour it into the pipe.

It is better to put the potash into the pipe, because the water it contains, instead of diluting, helps to form the lye. As water comes in contact with the potash it becomes hot, thus aiding in dissolving the grease. Potash, in combination with grease, forms a "soft" or liquid soap, which easily flows away, while the soda makes a hard soap, which, if not dissolved in water, would in itself obstruct the pipe. When a pipe is fairly cleaned out, the potash should be used from time to time, in order to dissolve the greasy deposits as they form, and carry them forward to the cesspool or sewer. The potash is very valuable for this purpose, because, in addition to its grease-dissolving powers, it is exceedingly destructive to all animal and most vegetable matter.

The most dangerous and deadly gases appear to come from urinals and wash basin pipes, these in many cases seeming to be more foul than those from water closets. The decay of the soap and animal matter washed from the skin appears to be the source of the gases. The potash will be effective in keeping the pipes clear, and in this way may lessen the dangers.

Measurement of Brickwork and Masonry.

Brickwork is measured by either one of four methods, viz.: By the number of bricks it contains; by the number of cubic feet; by the perch of 25 cubic feet; or by the reduced rod, consisting of 272 superficial feet and a width of a brick and a half. The first method is most generally employed, and the cubic foot and perch in a few localities. The reduced rod is the method used principally in England.

To ascertain the number of bricks contained in a wall: First find the superficial area, then multiply by 7½ (the number of bricks in one foot of brickwork 4 inches thick), and then multiply by the number of half bricks in the thickness of the wall. Example: How many bricks does a wall 12 ft. × 20 ft. and two bricks thick contain? Answer, 7,200, viz.: 12 × 20 = 240 × 7½ = 1,800 × 4 = 7,200.

Ashlar masonry, or that which is dressed either on face, bed, or side joints, is measured by the cubic foot; rubble masonry sometimes in the same way, but usually by the perch of 25 cubic feet.

Washboards.

A reporter on the Cleveland, O., *Leader* had a talk with the traveling agent of one of the largest washboard factories in the United States the other day. Said he: "Millions of washboards are made and sold in the United States every year, and at least 7,200,000 are sold yearly between the Allegheny Mountains and Missouri River. There are two factories in Cleveland which turn out 200 dozen washboards a day, one in Toledo which turns out over a million a year. There are at least twenty different varieties of washboards, and the best washboards are made in the West. The Eastern factories make their washboards of pine. The best wood for washboards is the cottonwood or the sycamore. Pine is too soft, and white pine is too expensive. The best washboards are made with dovetailed heads with wire nails driven across the grain of the wood. You can buy the poorer class as low as 80 cents a dozen at wholesale, and the better boards cost as high as $2.15 a dozen. Double washboards are those that have zinc ridges on both sides. The prices of these run from $1.60 to $3 per dozen. At retail washboards cost 25, 30, 35, 40, and 50 cents apiece. The first washboards were made of wood entirely, and our washerwomen used to pound the dirt out of the clothes with a stick by laying them on a board. The first washboards made of zinc were put upon the market about twenty-five years ago, and the style first invented is found the best to-day."

CARVED OAK ROOM.

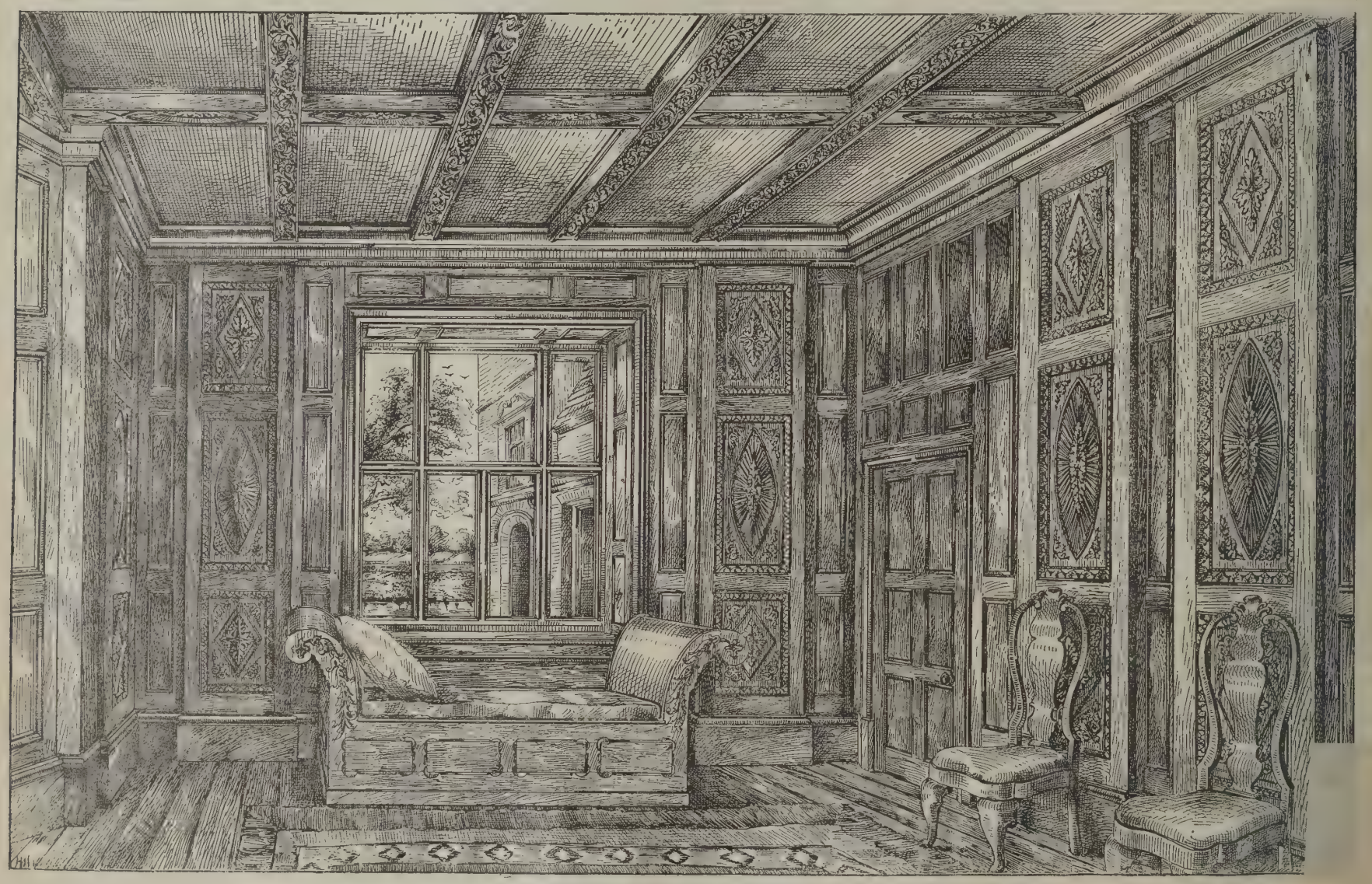
The room we illustrate this month has been erected and arranged for Lady Howard de Walden, Datchet, near Windsor. Our engraving is from the *Building News*. The tall carved panels have been adapted to their present purpose (having been previously at an old castle in South Germany) with great taste and skill. Nearly the whole of the oak in the room is old. The ceiling is constructed with massive beams and cross beams, richly carved with the conventional foliage of the period; while the panels thus formed are filled in with a dark painted canvas with good effect. The cornice has been made a satisfactory means of ventilation. It is one of the finest paneled rooms we have seen.

Trade Surveys.

The latest summary of building trade statistics in seven of the larger cities exhibits a rather surprising activity and a very gratifying outlook for the coming six months. The greatest general activity in building is exhibited throughout the West and Northwest. In the city of Chicago the value of permits for the first nine months of this year was $15,953,950 against $13,770,130 for 1885. The value of permits for week ending Nov. 6, against the previous week's, is nearly double. The building statistics of St. Louis exhibit a smaller increase, but at the same time a very gratifying one. In Kansas City, Omaha, Duluth, St. Paul, and Minneapolis, the increase in permits and in their value certainly points to an active winter and a more active spring. Building material of all kinds is very firm in prices, and in numerous cases contracts have already been entered into for building supplies for the spring. There is also an encouraging degree of building activity in a number of manufacturing and business enterprises between the Lakes and the Ohio Valley. Reports from Springfield, Joliet, Indianapolis, Columbus, Cincinnati, Toledo, Cleveland, and from the manufacturing strip along Eastern Ohio, as well as from Wheeling, Pittsburg, and from Central Pennsylvania, all justify the general and safe conclusion that an extraordinary amount of preparation is being made for building for the coming season. A great deal of the activity will be in manufacturing. There is an urgent demand for more capacity in iron and steel making, in glass making, wagon and carriage making, tool and implement manufacturing, and, in fact, in all the industries connected directly or indirectly with iron and steel using. The building trade conditions farther east are sufficiently familiar. The local building authority in New York city furnishes statistics showing that 3,704 buildings have been planned in that city between January and October, costing $53,119,068, against 2,874 buildings last year, costing under $40,000,000. The total number of conveyances is put at 11,242, against 9,195 for same time last year. The corresponding amounts of money are $201,826,369 and $149,511,513. The number of mortgages recorded in New York city is stated by the same authority to be 10,150, as against 8,433 for same time last year, representing in round numbers $117,000,000 and $86,000,000 respectively. The building statistics of Philadelphia exhibit a similarly active condition in house building, manufacturing, and shop building, and in real estate transfers. Real estate throughout Pennsylvania has been in active demand, and authorities there state that the sale of lots for building purposes to people able and intending to build has been far in excess this year of any previous year. The same activity is found to exist in Western Pennsylvania. A great deal of manufacturing capacity is seeking sites there, attracted by the economical advantages of natural gas. A vast amount of house building is projected by local capitalists for the coming year. Rolling mill capacity is being increased. New mills and furnaces are either projected or under way. The entire natural gas region will, it is evident, become the greatest manufacturing center upon this continent. Through Ohio, especially within reach of the natural gas region, there is a great deal of new building projected. The Ohio Valley is maintaining its prestige as a manufacturing region, but the greater part of the new enterprises are small concerns, involving an expenditure of $5,000 to $100,000. It is probable that there will be no serious advance in iron and steel or in their products. While trouble is probable in the building trade, it is scarcely possible in the iron trade. The two classes of mill labor are controlled by yearly contracts, one of which expires in January and one in June. All kinds of iron and steel are high and firm in prices, but prices are not likely to be jeopardized by any speculative influences.

The distribution of all kinds of lumber has been remarkable. Mills in the Northwest are, in numerous cases, operated day and night to accumulate stocks sufficient to meet the requirements which the developments of the past two months have shown to be necessary. Freights have been advanced both by lake, rail, and coastwise. Dealers have advanced quotations correspondingly, and buyers are still making haste to cover winter requirements. No scarcity is probable. Saw mill capacity in the Northwest and South has been largely increased, and presumably, therefore, the future supplies will be greater. Lumber manufacturers have been hopeful all along that the cut, now nearly over, would not crowd the market. It is only the extraordinary demand which keeps prices at anything like remunerative limits. The industrial situation generally is strong. Fuel is in active demand, shop capacity is oversold, capitalists feel more inclined to extend their investments in industrial directions, and in view of the general activity and strengthening of prices, the wonderful expansion going on North and South will meet the extremest requirements of the country. Foreign iron and steel markets are improving, and large orders are now in hand for rails, blooms, billets, crude iron, and other products. The American rail makers have sold one-third of their producing capacity of next year, and the car and bridge builders are hurrying in orders. Both at home and abroad the industrial revival is significant. The activity abroad means higher prices here next year.

The labor question continues to occasion distrust. Employing interests desire a settlement of wages during the winter, yet they do not feel inclined to ask their employes to meet them for that purpose. Organization among employers is growing in many industries. The compacts made have been maintained and are restoring confidence. The unfortunate eight-hour strike at Chicago revives distrust as to the probable future course of the Knights of Labor, but employers generally have faith that, so far as that organization is concerned, there will be no official recognition or aid given to a general movement to that end.—*Amer. Architect.*



CARVED OAK ROOM.

Tile Roofs.

The greater comfort experienced in living in buildings roofed with tiles instead of slates is universally acknowledged, for slate, being, like metal, a great conductor of heat, renders the rooms hot in the summer and cold in the winter. Slates are apt, in cold weather, with certain atmospheric conditions, to cause condensation on their inner surfaces, and the moisture collects, runs down, and, lodging on the framework of the roof, causes decay of the lathing and timbers. Tiles are not liable to these objections. Tiles for fire proof coverings are easy to use, and inexpensive. They can be laid on hoop or iron wire rods, instead of pantile laths, and when so done are practically indestructible. Slate, under the action of fire (and particularly if water be thrown on it when hot), cracks and flies in all directions, and the draught occasioned through the apertures thus caused increases flame. Tiles, even when red hot, will still preserve the roof entire.

Tiles have another superiority over slate—they are far more picturesque; and when a roof is treated with ornamental and parti-colored tiles, as in Austria and Bavaria and parts of Holland, the effect produced is excellent, and it would be well to be in more general use, though within the last few years they have been far more commonly introduced.—*Brick, Tile and Metal Worker.*

Bakers and Bad Teeth.—Dr. Hesse, of Leipsic, says that bakers suffer especially from dental caries. This is due, he thinks, to flour dust, which gets into the teeth and produces an acid fermentation.

Ten Mile Cannon.

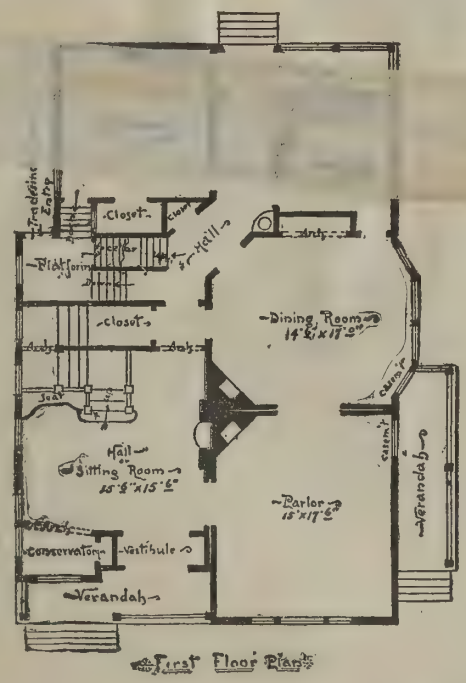
The two largest breech loaders ever made, and, at the same time, the largest naval guns, are those for the English war ship Benbow. Each weighs 247,795 lb., or rather over 110 tons, and will probably carry ten miles. The shell weighs 1,800 lb., and the powder charge, not yet quite decided upon, will be about 800 lb. The "proof" carriage, for guns from 43 to 110 tons, has two four-wheel bogies like those of a locomotive, and four other wheels, braked, between them. The recoil is taken up by a hydraulic cylinder, and there is a loading derrick above the breech. Ships armed with these guns might form a position two miles out from the Coney Island shore, and throw shells into the heart of the city of Brooklyn.

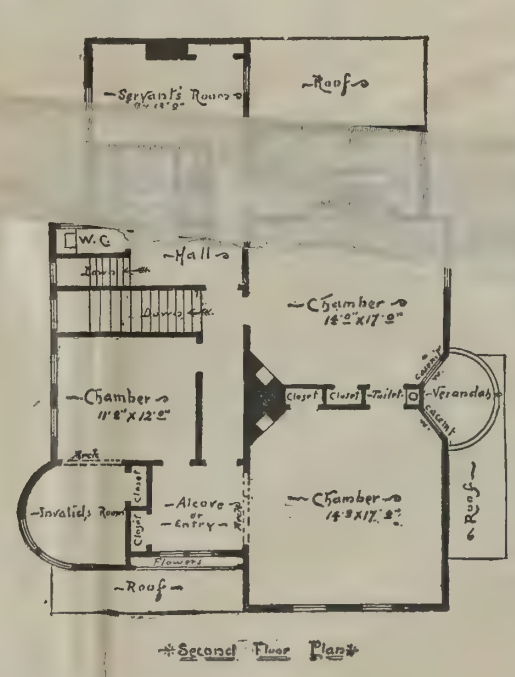
A RESIDENCE OF MODERATE COST.

The illustration herewith presented is that of a frame residence of moderate cost, embracing all modern improvements, and suitable for city or country. The exterior dimensions of the building are 32 feet wide by 48 feet long.

The height of the first floor is 3 feet above the level of the ground, and is reached by wide steps leading to the front veranda, whence a pair of double storm doors open into a vestibule which is made of the proper dimensions to receive a door on each side. The floor of the vestibule is one step lower than that of the main floor, and from it a neat pair of doors, with glass panes, open into the front hall. The latter doors are arranged to swing either inward or outward, so that they can be opened into the vestibule, thus offering abundant space around the sliding doors to the parlor. By the adoption of this plan, the parlor, dining room, and hall can easily be thrown together on occasions of home entertainments. The hall is square in form, being 15 feet 6 inches, and possesses many useful and attractive features.

The parlor is 15 feet wide and 17 feet 6 inches deep. It is lighted by a triple window on the front, and also by a French window on the side, which opens off on the veranda. Sliding doors connect it with the dining room, which is of the octagonal form, having a mullion window virtually obtaining a trance to these rooms on this side. A door leading into the rear hall, and a fireplace in the other, occupy the remaining two angles. By arranging the fireplaces as shown, it will be observed that those of the parlor, hall, and dining room, are all attached to one another, thus obviating much expense otherwise to be incurred. A door leading into the front hall, and a position for the sideboard, are as shown. The recess for the latter is capped over by an arch, so that curtains can conceal the sideboard if it is desired. Immediately adjoining is a door leading into the pantry, which is 8×10, with access to the rear end, lighted by windows on each side. Here is found a soapstone sink and dripboard, for the washing of fine dishes, and ample shelving for the same and for holding victuals; also a secret closet to hold a small safe for the concealment of all valuable silverware.





On ascending the front stairs, we land in a corridor three feet and six inches wide, from which each of the principal bed rooms is entered. The first door before you, on landing, enters into a chamber 14×17 feet, located directly over the dining room, and lighted by a neat mullion window, and also by a French window placed in the angle. The latter opens off on a small balcony, formed on top of the roof of side veranda This room is provided with a fireplace and closet, and has the use of a toilet stand arranged in the entry as shown, and through this room the front room can be reached.

The family bed room is entered from the hall through the entry, or alcove, and is lighted by three large windows; it has a closet, toilet and fireplace arrangement shelved for fruits, jellies, etc., with a window to light it.

The first story will be 11 feet 6 inches, second, 10 feet. We herewith attach a preliminary estimate of the probable cost of such a structure as represented, basing our figures on St. Louis market prices:

ESTIMATE OF COST OF BUILDING AS ILLUSTRATED.

Excavations	$50.00
Rubble masonry	280.00
Brick work	250.00
Lumber	950.00
Mill work	500.00
Tin and copper work	115.00
Plastering	400.00
Painting	225.00
Plumbing	175.00
Stairs	175.00
Mantels and grates	150.00
Hardware	125.00
Labor	600.00
Total	$3,995.00

—St. Louis Architect and Builder.

Egyptian Bricks.

Bricks—*tebi* made in a mould, or sun-dried clay mixed with straw, pounded pottery, and other materials—were extensively used for construction in ancient Egypt. At the earliest period the use of baked bricks was unknown, but some objects of this class occur at the time of the twelfth and following dynasties, of baked red terra-cotta of conical or square shape, the use of which is not decidedly known. The bricks of unbaked clay vary in dimensions from 1 foot 8 inches to 1 foot 3 inches long, and are in thickness from 8½ to 4½ inches, and weigh about 16 lb. The largest are those of the earliest dynasties before the sixth, and they become of smaller dimensions under the eighteenth and following dynasties. At the earlier period, rude marks, spirals, curves, or devices, made by pressing the finger or fingers of the hand into the moist clay, were impressed on the bricks; but at the time of the eighteenth dynasty, stamps were introduced of an oval or square shape, having in relief the prænomen or name of the monarch, or the name or titles of the persons for whose buildings or constructions they were made. The stamps on the bricks commence under the eighteenth and continue to the twenty-second dynasty. These bricks were extensively used in the construction of pyramids, palaces, walls, private houses, fortresses, and other constructions, the absence of rain making them sufficient to withstand the climate. Representations of the making of them by foreign captives or prisoners of war, corresponding with the account of the bondage of the Israelites and the labors imposed upon them, are seen in the tombs of the eighteenth dynasty.—*S. Birch.*

Gilding on Glass.

The Glass Decoration Company, London, have introduced a newly discovered process of gilding on glass, which consists of the deposit of a solution of chloride of gold on the surface of glass, and is similar to the silver process now in use. Considerable decorative effect is obtained by enriching the ground, or surface, by means of eating out devices, such as borderings, the gold thus producing a nice crystalline effect. The glass, in short, may be treated in various ways, by brilliant cutting, drilling so as to form the design or lettering, and then be subjected to the process. The glass name panels, in which the ground is crystallized and the lettering plain gold, show the many different purposes for which the tion of it will be of value in the fitting up of saloons, buffets, bars, and church decoration. A drawing room decorated with the gilded glass is to be mentioned. The chimneypiece and overmantel had panels of the decoration introduced with painted floral and other devices in the centers of each, producing a very rich, if not gorgeous, effect. The door, panels, and window linings were also embellished by gilded glass; the former were relieved by medallions of hand-painted floral subjects. We also noticed wall brackets and panels similarly treated. For sideboards and cabinets this kind of glass decoration is well suited, as it can be enriched by hand-painted designs.

Royal Society Medals.

The president and council of the Royal Society have awarded the Copley Medal to Herr F. E. Neumann, of Koenigsberg, foreign member, for his researches in theoretical optics and electro-dynamics, and the Davy Medal to M. J. C. G. G. De Marignac, of Geneva, foreign member, for his researches on atomic weights. Professor Samuel P. Langley, of Allegheny, Pa., has been awarded the Rumford Medal for his researches on the spectrum by means of the bolometer. Mr. Francis Galton, F.R.S., and Professor Guthrie Tait have been nominated for the Royal Medals, the former eminent for his statistical inquiries into biological phenomena, and the latter for his various mathematical and physical researches.

FIRST CONGREGATIONAL CHURCH, MINNEAPOLIS.

Location, cor. 5th St. and 8th Av., S. E.; cost, $60,000. Material, Bayfield brownstone. Architect, W. H. Hayes, Minneapolis. Our engraving is from the *N. W. Architect and Improvement Record.*

Architectural Charges for Professional Practice.

The usual and proper charges of architects for professional work, such as drawing up designs and superintending the erection of buildings, is given in the following schedule, which is issued under the authority of the American Institute of Architects from its New York chapter.

Designing and Supervision.

For full professional services, including the supervision of the buildings during erection, five per cent on the cost of the work. In case of the abandonment of the work, the charge for partial service is as follows:

Preliminary studies	1 per cent.
Preliminary studies, general drawings and specifications	2½ "
Preliminary studies, general drawings, specifications and details	3½ "

For works that cost less than $10,000, or for monumental and decorative work and designs for furniture, a special rate in excess of the above.

For alterations and additions—an additional charge to be made for surveys and measurements.

An additional charge to be made for alterations and additions in contracts or plans, which will be valued in proportion to the additional time and services employed.

Necessary traveling expenses to be paid by the client.

Time spent by the architect in visiting for professional consultation and in the accompanying travel, whether by day or night, will be charged for, whether or not any commission, either for office work or supervising work, is given.

The architect's payments are successively due as his work is completed, in the order of the above classifications.

Until an actual estimate is received, the charges are based upon the proposed cost of the works, and the payments are received as installments of the entire fee, which is based upon the actual cost.

The architect bases his professional charge upon the entire cost to the owner of the building, when completed, including all the fixtures necessary to render it fit for occupation, and is entitled to additional compensation for furniture or other articles designed or purchased by the architect.

If any material or work used in the construction of the building be already upon the ground, or come into possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Supervision of Works.

The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect, or his deputy, of a building or other work in process of erection, completion, or alteration as he finds necessary to ascertain whether it is being executed in conformity with his designs and specifications or directions, and to enable him to decide when the successive installments or payments provided for in the contract or agreement are due and payable. He is to determine in constructive emergencies, to order necessary changes, and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work, and order its removal when not in accordance with them.

Clerk of the Works.

On buildings where it is deemed necessary to employ a clerk of the works, the remuneration of said clerk is to be paid by the owner, or owners, in addition to any commissions or fees due to the architect. The selection or dismissal of the clerk of the works is to be subject to the approval of the architect.

Extra Services.

Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved, at the discretion of the architect.

None of the charges above enumerated cover professional or legal services connected with negotiations for site, disputed party walls, rights of light, measurement of work, or services incidental to arrangements consequent upon the failure of contractors during the performance of the work. When such services become necessary, they shall be charged for according to the time and trouble involved.

Drawings and Specifications.

Drawings and specifications as instruments of service are the property of the architect.

FIRST CONGREGATIONAL CHURCH, MINNEAPOLIS.—W. H. HAYES, ARCHITECT.

A Convenient and Certain Mode for Tempering Steel.

Mr. James A. Peck, of Brewsters, N. Y., mechanical engineer of the N. Y. Condensed Milk Co., gives us the following method discovered by him, and which he uses with great success for tempering all kinds of tools, knives, razors, steel dies, and other implements.

Take a suitable quantity of muriatic acid, dissolve all the zinc the acid will take.

Prepare a tempering bath composed of one part of the above zinc acid and one part water.

Heat the steel according to its hardness.

If high or hard steel, heat until just red and then temper in the acid bath.

If low steel, heat it as hot as you would to temper in water, then temper in the acid bath.

After immersing in the acid bath, cool off in water.

For lathe and planer tools draw no temper; but for other tools draw temper. Unlike water tempering, the colors that appear under this method give no clew to the hardness.

By this process, steel is readily hardened to any desired degree, and may be made to cut glass like a diamond.

If desired, an acid bath composed of two parts of muriatic acid and one part water may be used. Mr. Peck, however, prefers the zinc acid, as being more dense.

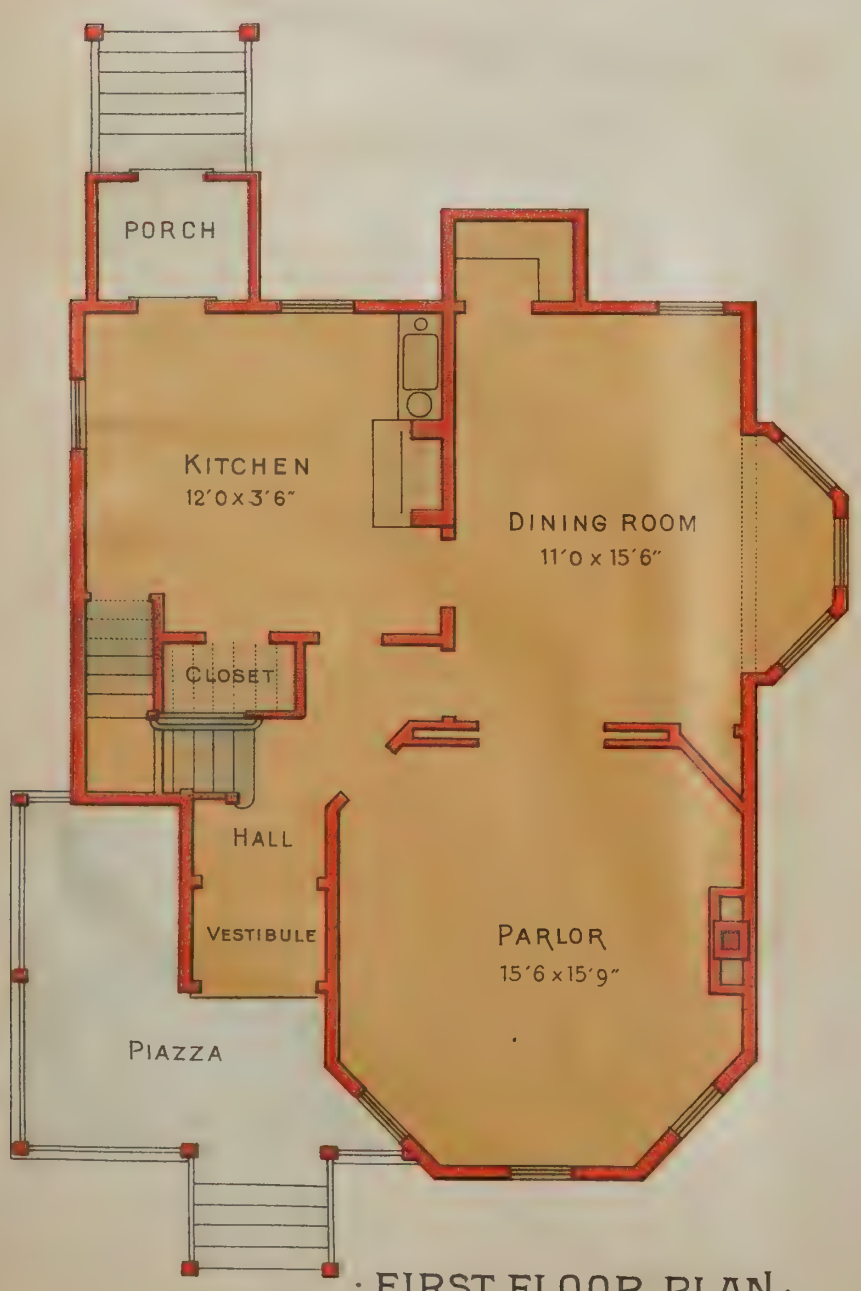
A prominent advantage of this method of tempering is the certainty and excellence of its results. It never fails to yield the temper required. It can be relied upon for every description of steel or tool.

A New India Rubber.

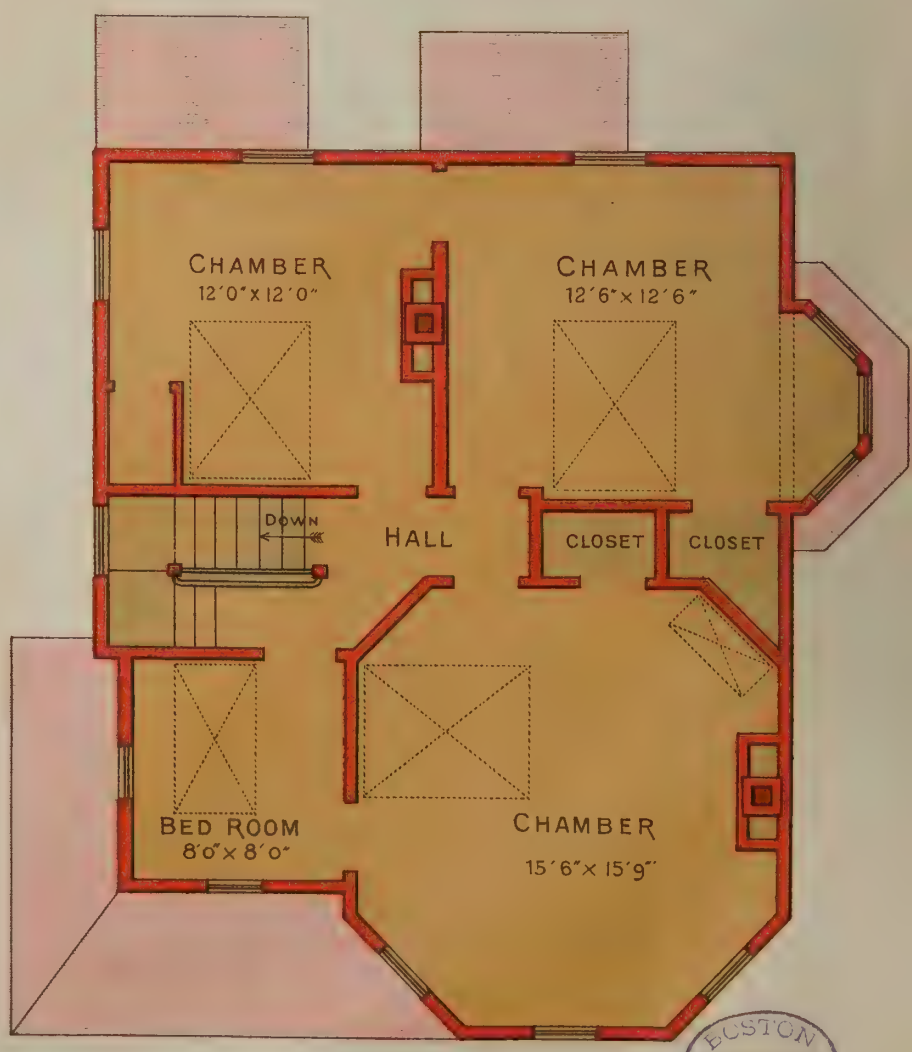
According to the *Bulletin de la Societe de Chimique de Paris*, a plant, the *Sonchus oleraceus*, which grows wild in France in dry places, along roads, and among rubbish, has been found to contain India rubber. This is extracted by treating the plant with sulphuret of carbon, and boiling the residuum with alcohol. The mass is then heated with alcoholic potash, and washed several times with warm diluted alcohol. This removes all greasy and waxy matter, as well as chlorophyl. The residue is elastic, and presents all the characteristics of India rubber. It dissolves entirely in sulphuret of carbon and in chloroform, and partly in ether.

A COUNTRY DWELLING OF MODERATE COST.

B. J. SCHWEITZER, ARCHITECT, NEW YORK



· FIRST FLOOR PLAN ·



· SECOND FLOOR PLAN ·

ST. JAMES' RECTORY, FORDHAM, N.Y.

EDWARD A. SARGENT, ARCHITECT, NEW YORK.

·GROUND FLOOR PLAN·

·SECOND FLOOR PLAN·

A HALL SCREEN.

We give a sketch of the hall screen in the residence of Marmaduke Tilden, Esq., by William H. Beers, architect, New York.

Weathering Stone.

In ordinary conversation, stone is very generally taken as an admitted type of extreme hardness and the utmost durability. It is this opinion which finds vent in the ordinary phrase of comparison that a certain thing is "as hard as a stone."

But this popular view of the qualities of stone is a singularly erroneous one.

True, there are stones which are hard; but then, again, there are stones which are very soft.

It is also, doubtless, true that there are stones which are very durable; but it is no less an incontestable fact that there are stones which are very perishable.

The hardness and durability of a given stone depend upon several causes. Among these may be specified its chemical composition, its structure, and whether it has been brought to its present state mainly by igneous or by hydrous agencies.

The question of the relative hardness of building stones only affects the architect or builder as regards the greater or less quantity of labor required to work them or to bring them to certain forms.

The much more important question of durability not only affects the architect and builder, but the patrons who employ them; and, yet more, the whole of posterity, whose pride and rejoicing in a noble edifice, or whose regret and vexation over a crumbling ruin, will depend in an immense degree on the judicious selection of the material employed in building it.

In certain favored regions the air is so pure and dry that the architect has no cause for anxiety about the matter. He literally has no need to "take thought for the morrow," as far as his building is concerned, let him employ whatsoever materials he will in erecting it.

In the splendid atmosphere of the valley of the Nile, not only will any description of stone remain unchanged and uninjured through centuries, but even the vividly tinted painting with which the ancient Egyptians covered the walls of palace, of temple, of tomb, has come down to us for thousands of years untarnished and uninjured.

The climate of Greece is similarly propitious to the builder.

About 2,300 years ago (B.C. 440), Iktinas erected on the Acropolis of Athens that magnificent temple of the Virgin Goddess Athene which we term the Parthenon, and Pheidias, the greatest of the sculptors of Hellas, enriched it with those immortal works of his chisel which are forever famous. Both temples and statues were formed of pure white marble from the famous quarries of Pentelicus. The hand [illegible] werless to deface or injure [illegible]ble stone, although the [illegible] Venetian and the gun- [illegible] Moslem brought the splen- [illegible]n, a ruin afterward assist- [illegible]ge of more civilized men. (For although we, as a nation, have benefited by the pillage, still truth must be spoken.) But no detail either of the ruin which towers above Athens or of the scattered fragments which enrich the courts of our national museum has lost one iota of its freshness, sharpness, and delicacy from the touch of Time's "effacing finger." This is a point which every one may verify for himself or herself.

This Pentelic marble, thus found so enduring, is, of course, a limestone. Let us now see how a limestone fares in the corroding air of our "misty isle." It is, of course, true that we have no native limestone equal to Pentelic marble, either in hardness or closeness of texture; but if we had, they could not withstand a climate before which even granite succumbs.

"Limestones and dolomites," says Mr. E. Hull, F.R.S., "are especially subject to disintegration from the influence of rain charged with acid, and this country presents numerous unhappy examples of its effects. Of these, perhaps, the cases of St. Mary Redcliffe Church, in Bristol, the new Houses of Parliament, and Henry VII.'s Chapel in Westminster Abbey are the most instructive examples—the first built of oolitic limestone, the second of dolomite, and the third of Caen stone, a white limestone of Normandy, of Jurassic age. Even the portions of this exquisitely beautiful structure restored with Bath oolite about a quarter of a century ago have given way before the influence of an atmosphere charged with smoke and dripping with moisture most of the time.

"For such climates, therefore, limestones, especially soft, granular, and porous kinds, should as far as possible be avoided, and even sandstones which contain a notable percentage of calcareous matter in the form of cement. The best kinds of building stones for smoky and wet climates are siliceous sandstones, formed of grains of quartz cemented together by a siliceous or feldspathic paste. In Great Britain such rocks are largely distributed among the lower carboniferous formation of Scotland, the North of England, and Wales, the materials of which they are composed being derived from the disintegrated gneissose and granitic rocks which formed the land of the period. Such rocks are almost indestructible, and have been used with good results in some of the large manufacturing and smoky towns and cities of those districts where they occur. Being destitute of carbonate of lime or magnesia, they are not exposed to the corroding action of the acids which pervade the air."

While perfectly agreeing with the views of Mr. Hull, as expressed in the foregoing extract, we do not consider it at all likely that architects and builders will readily relinquish their *penchant* for the limestones—a predilection which their easy workability and good appearance render not at all unreasonable.

The "weathering" of stone, as the influence of climate upon it is called, is a matter much studied by modern builders, and justly so, because the selection of the best possible material for any edifice is clearly a matter of paramount importance.

Many building stones of the class to which we have referred consist chiefly of carbonate of lime and carbonate of magnesia in about equal proportions. It is the sulphuric acid found in the rain water which descends on urban districts which so seriously affects stones of this description. Much, however, depends upon the *structure* of the stone itself. If this be crystalline, the stone, despite its chemical composition, may be good and durable; if, on the contrary, it be "amorphous"—that is, not having any determinate form of its constituent atoms—it very readily suffers. But in a large city, where the atmosphere is inevitably largely impregnated with acid vapors, even the crystalline limestone cannot but suffer.

The action of the acid on a magnesian limestone, such as that of which we are speaking, is that the sulphuric acid displaces the carbonic acid of the carbonate of lime, and forms with the magnesia a sulphate which is soluble in water, whence results the mischief.

In illustration of this fact, we may remark that it has lately been proved that in the atmosphere of a large town, with abundant coal smoke and rain, inscriptions in marble become illegible in half a century.

It is thus apparent that a certain stone may appear hard and durable enough in a pure country atmosphere which would yet be of no value in a large city. The carbonic, sulphuric, nitric, and hydrochloric acids of the latter *locale* all conspire to rot the stone.

The architect or architectural student, therefore, desirous of estimating the value of any particular stone for city use has many things to take into account in making his appraisement. In the first place, he has to discover the chemical constitution of his specimen, which has to be accomplished in the ordinary way of chemical analysis. Then, seeing how important is the part played by the structure, he has to decide by ocular inspection, aided, if necessary, by the microscope, whether the rock be crystalline or amorphous, bearing in mind that in the latter case the risk of its succumbing to the deleterious atmospheric influences of a town are considerably increased.

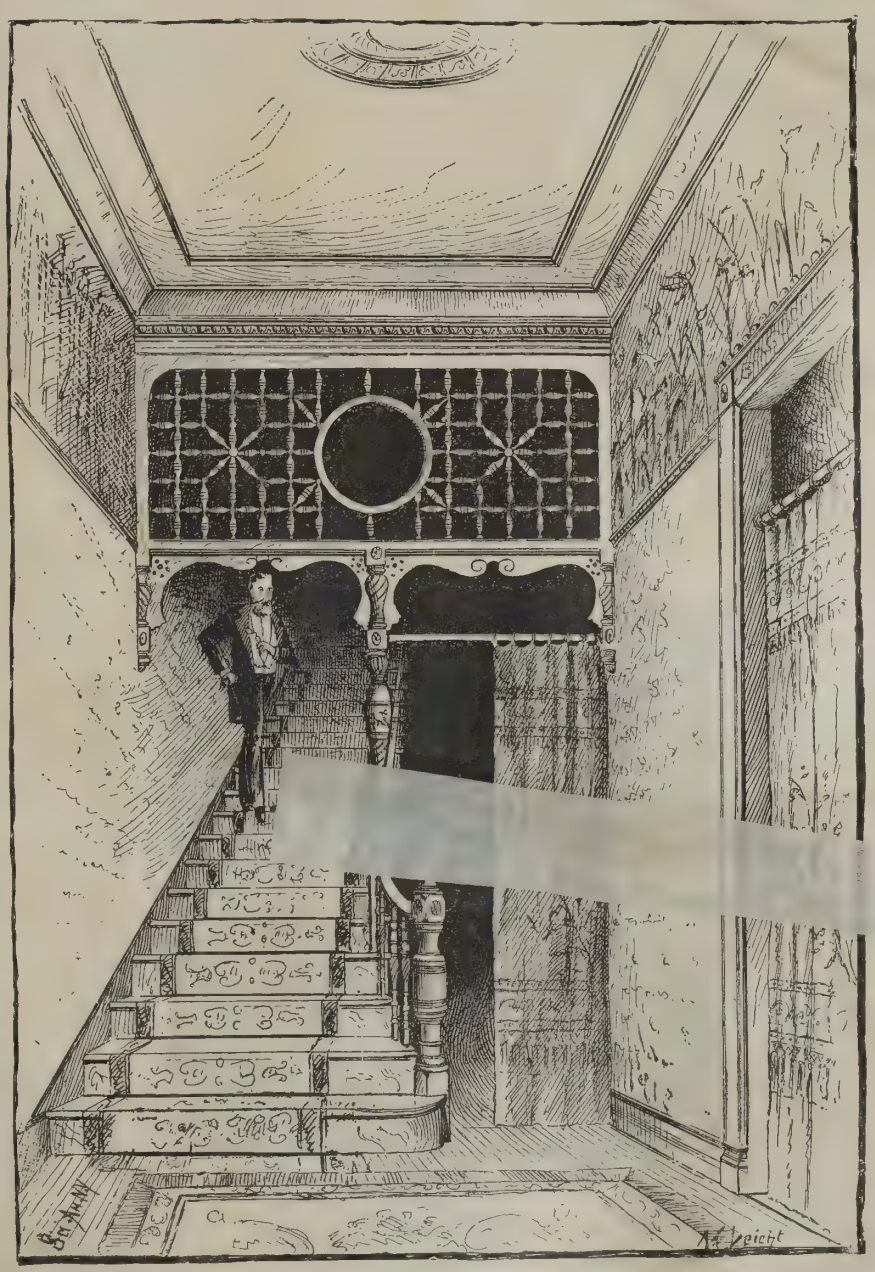
Various plans have been tried to discover the resisting power of stone in this regard, none of which, however, can be pronounced very successful.

Solutions of very weak hydrochloric or sulphuric acid have been made, in which pieces of the stone under examination have been placed and left for several days. It is said that the action of these acids on the stone shows roughly whether it is capable of being durable or not in the atmosphere of a large town.

The purity of a limestone may be roughly estimated by chipping a piece off a block, and putting it into weak hydrochloric acid. If much impurity is present, it will be shown by an insoluble residue which will remain behind. The acid may attack some of the impurities, but the proportion of non-calcareous matter so attacked is usually extremely small.

Mr. C. H. Smith proposed a test in which several damp pieces of the stone might be placed in a glass about one-third full of water. After a lapse of about half an hour they should be agitated, and if the water then has a milky appearance it shows that the stone is not thoroughly crystalline, but contains some earthy matter. If the water is very milky, it shows that the stone is not very durable.

These considerations will, we think, prove that the proverb "Hard as stone" is deceptive, at any rate in an architectural sense.—*Builders' Reporter.*



DESIGN FOR A HALL SCREEN.

[illegible]oring of Metals.

[illegible]ring to the *Illustrirte Zeitung für* [illegible] color- ing on copp[illegible] ing the object for trea[illegible] well cleansed, in a weak solution [illegible] of sulphur. When a caustic effect has after a short time, been produced, the object is rinsed, slightly heated, and brushed with a stiff brush. This coating is said to be very durable.

A blackish brown bronzing can be applied to vases, figures, busts, etc., cast from zinc, by the application of a solution of sulphate of copper. If the projecting portions are then well rubbed with a woolen rag, they assume a coppery red brilliancy, which increases the resemblance to genuine bronze. A solution of verdigris in vinegar also produces an effective bronzing.

Brass may be colored black by repeatedly coating the cleansed metal with a moderately warm solution of nitrate of copper. Heating over a charcoal fire follows. Finally, the tone is heightened by rubbing with olive oil.

HOW TO MAKE PAPER ROSES.

Of all artificial flowers, the easiest made, the cheapest, and I may add, in my opinion, much the prettiest, are paper flowers. I append a few plain directions with regard to making them, which, if followed out carefully, will give excellent results. To make a rose like Fig. 8, first get a piece of tissue paper and cut it square—3½ to 7 inches square, according to the size of flower you wish to produce—bring the opposite corners of the paper together (Fig. 1), folding it into a triangular shape; redouble it twice again in the same way and double it in the shape of Fig. 2 ; cut the top round (see Fig. 3), then cut it in the center a little more than half way down, as you can see in Fig. 4 ; open it out and make a hole in the center (Fig. 5). To make a complete rose, you must have eight pieces of paper like Fig. 5. Take a piece of cloth or wool and wind it around a thin piece of wire for the stem, and cover it with a piece of green or yellow paper (Fig. 6), and put the wire through the hole in the center of Fig. 5 ; then, after you have placed the stem through the center of Fig. 5, you must proceed to turn the petals or parts down, first taking one of the parts or petals, and then the one right opposite, and so on until you have turned them all down. Press the edges lightly, then take a pin and lift them one by one, until you have lifted every one of them up. Take a piece of sealing or bees wax, and place it around the stem just under the pieces, so as to stop them from falling off, and take a piece of paper and paste it neatly over the wax, and cover the stem with a piece of green paper. To make the rose like Fig. 10, provide a long, narrow piece of paper, and fold it so as to form nine equal parts (Fig. 9) ; cut them about half way down at the beginning of each part, and curl the upper corners by taking a pair of scissors and drawing the paper between your thumb and the blade of the

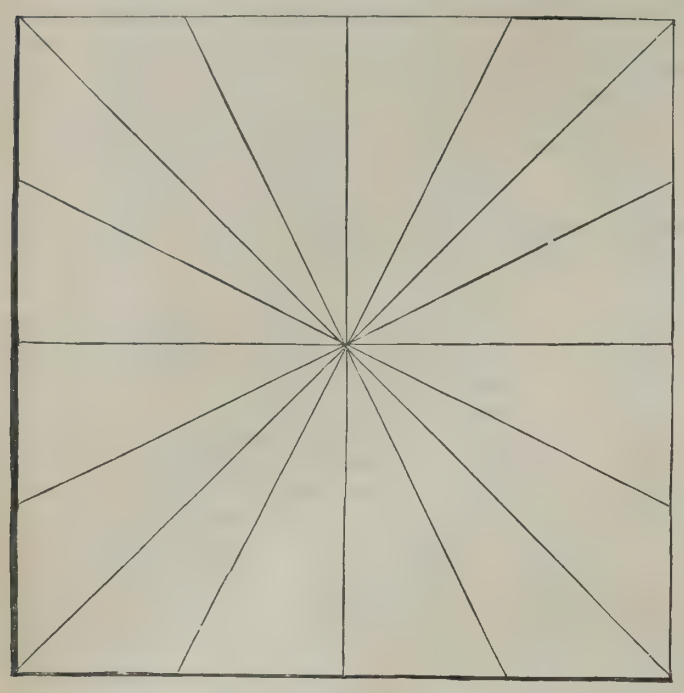


Fig. 1

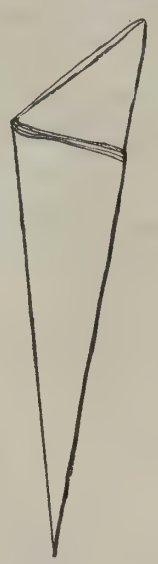


Fig. 2.

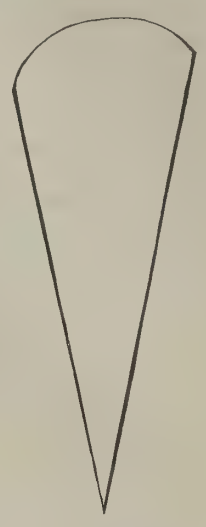


Fig. 3.

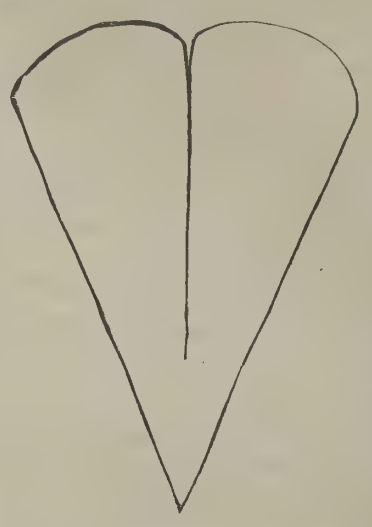


Fig. 4.

Fig. 6.

Fig. 9.

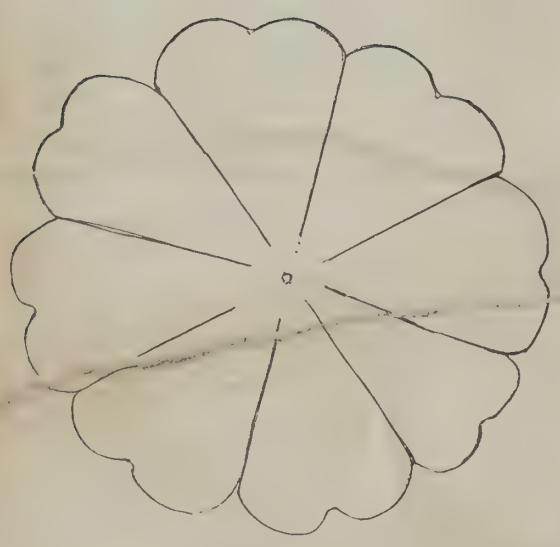
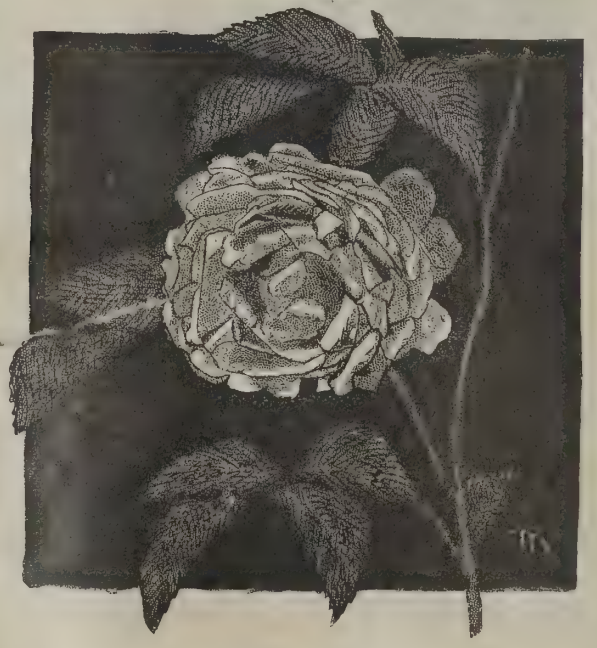


Fig. 5.



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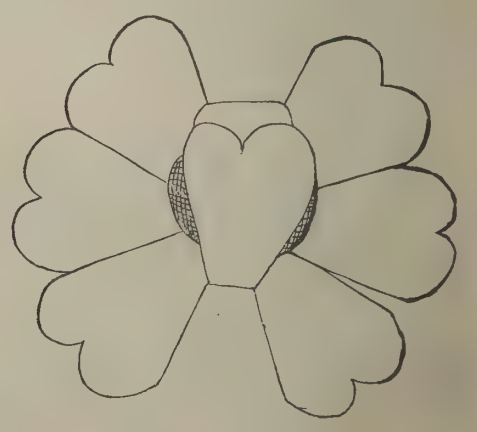


Fig. 7.

Fig 10

HOW TO MAKE PAPER ROSES.

scissors. After you have done this, proceed to fold it. In folding it, you first wrap it twice around your first finger, then place your second finger close to your first, and wrap it around both fingers three times. Placing your third finger close to your second finger, you wrap the remainder of the paper around all three fingers, then twist it at the lower end and fasten a stem to it by twisting a fine wire around it, or by a small piece of beeswax, and then place the leaves on the stems as follows: To make the leaves, get a piece of green paper and cut it out in the shape of a rose leaf, or, if you have a book with illustrations of rose leaves in it, you can just place the tissue paper over the illustration and trace it with a pen or lead pencil. Cut it out and leave a narrow strip at the lower end of the leaf, so as to fasten it to the stem; get a piece of thin wire, the same as you did for the rose. For the stem, first fasten the leaves to it by twisting the narrow slip at the lower end of the leaf around it, and so on until you have fixed all the leaves in their proper places; then take another thin slip of tissue paper and twist it around the stem, commencing at the upper end, and when you have covered it all over, take a little paste or mucilage and fasten the lower end securely to the wire. A very nice parlor ornament can be made by taking a fan and fixing a bunch of these flowers to it. These flowers look much more natural than the wax flowers, and are more decorative for ornaments.

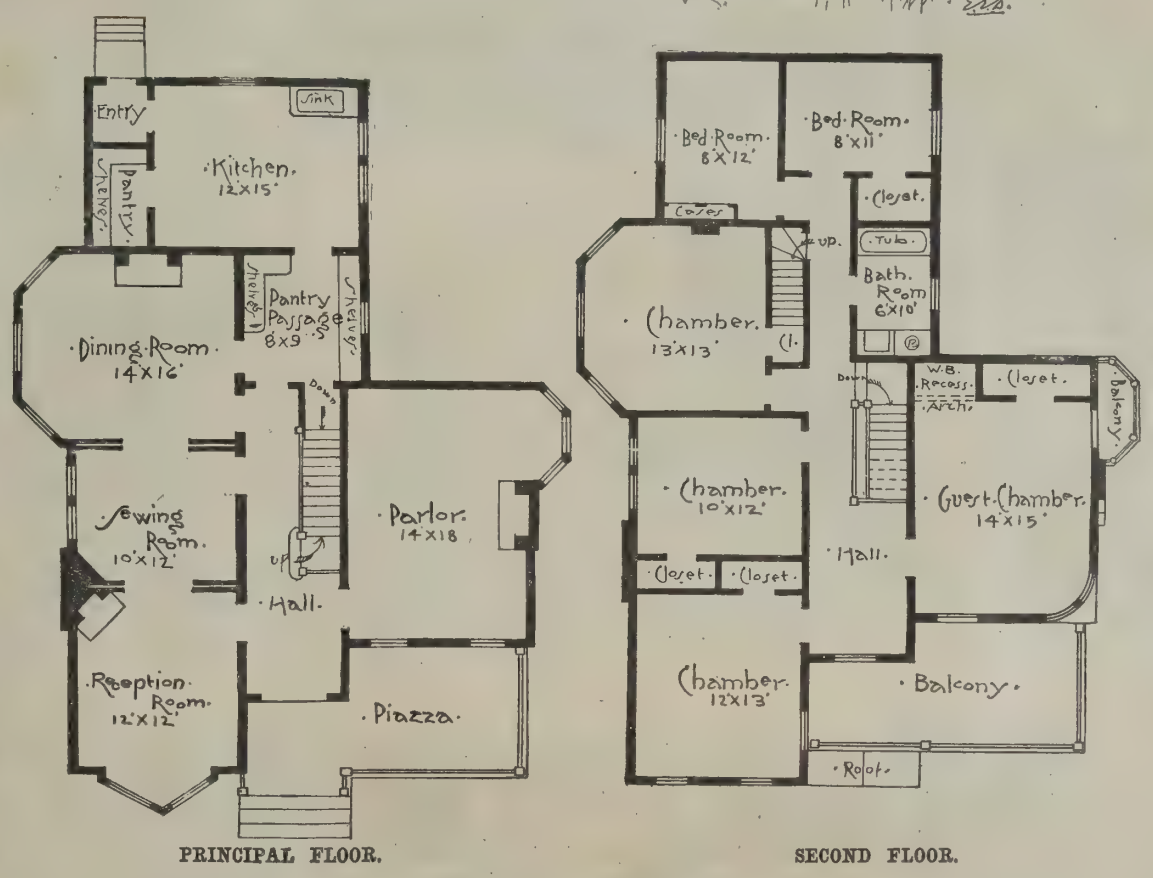
OLIVER NUGENT.

TWO DWELLINGS OF MODERATE COST.

The cost of a house greatly depends upon the interior finish, so that mere size or contents of a certain number of rooms indicates little as to [illegible] for instance, the [illegible]h in the upper [illegible]ough the cost as [illegible]3,500, might pro[illegible]t for $3,000 if a [illegible] were adopted, [illegible]at sum could be [illegible]out difficulty if [illegible]ate details of in[illegible]a and decoration we[illegible]. The size of the ho[illegible]ite moderate, but is[illegible] perhaps, more in demand than any other.

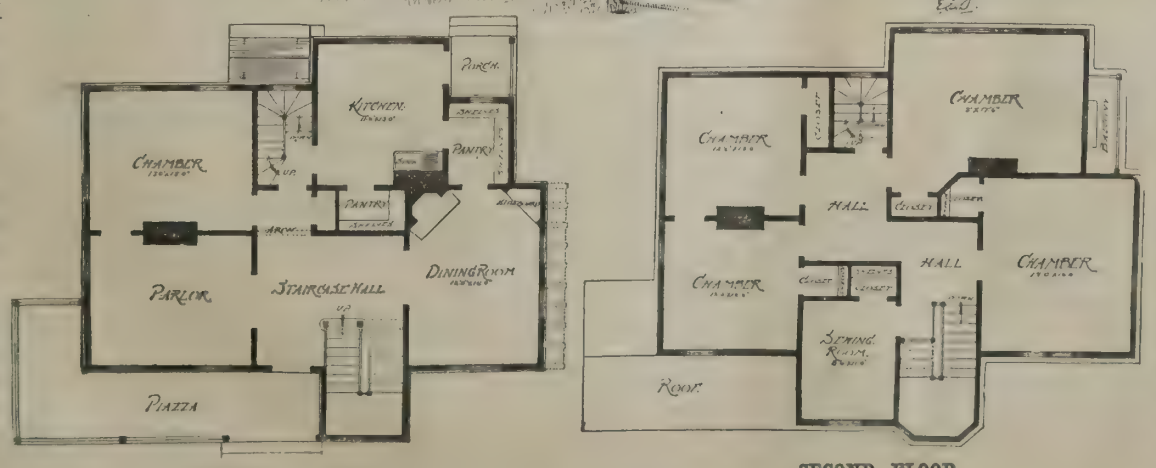
The materials used in construction were of first class quality, and, perhaps, rather better than is usually found in houses of the size. A cellar is provided, and hard wood trim is employed in the parlor and staircase—a material item of expense which could be easily lessened in adopting the design. The exterior of the house is shingled on roof and second floor, and is clapboarded below.

Our lower engraving shows a comfortable looking little residence, which has been built at Little Falls, N. Y., from the designs of Mr. A. W. Fuller, architect, of Albany, N. Y. It cost $4,500, and is a very satisfactory design, with a certain freshness in treatment that is quite pleasing. The first story is clapboarded, and the second story and roof are shingled. There is one finished room in the attic, and a dry cellar below. The trim is pine, with hard wood in the principal rooms, and a careful system of heating and ventilation has been effected throughout the building.



PRINCIPAL FLOOR. SECOND FLOOR.

A DWELLING COSTING $3,500.



PRINCIPAL FLOOR. SECOND FLOOR.

A DWELLING COSTING $4,500.

Hemlock Lumber.—Southern Furniture Factories.

According to the *Northwestern Lumberman*, hemlock is gradually gaining ground. Every winter, it says, more hemlock is banked, and every year objections to it are possibly a little less pronounced. It would show excellent sense if the people in the West would do away with their prejudice against a wood in favor of which so much can be said. Some day they will certainly be forced to use it extensively. White pine will not last always, and when it shall have largely disappeared, hemlock will, in a measure, take its place. People will use it for dimension, barn and fence boards, and it would not be surprising if for the cheaper class of finishing.

—It is to be noticed that in the floating news about Southern industries, frequent mention is made of the starting of furniture factories. As the South grows in population and wealth under the stimulus of revived ambition to rival the North in material prosperity, there will be a rapid increase in the demand for furniture. Fortunately for this industry, there is almost an endless amount of furniture wood in the South, with which to stock factories located in that section much cheaper than Northern manufacturers can procure it. It would not be a matter of surprise to see, within a few years, such a growth of the furniture business in the South as shall become a serious competition with Northern manufacture.

The comfort and utility of a house depend so much upon the arrangement and relative position of the rooms that the success of a design in execution may almost be said to depend upon the manner in which the planning is executed. Unfortunately, this fact is often overlooked, and essential details of the plan are sacrificed for features of the elevation. It is quite common, for instance, to find the kitchen planned in such a manner as to place it in an out of the way position, entailing considerable labor to the servants in going backward and forward, or else it is placed in such a way that the smell of cooking and the noise from the kitchen can be known in anything but a pleasant manner all over the house.

Mr. Fuller has in this design skillfully avoided both errors. He gives a really artistic elevation, with an excellent plan, in which the kitchen is placed in a position convenient for access to the dining room and other parts of the house, and, at the same time, sufficiently isolated to completely prevent any annoyance. The two staircases form another convenience in the same direction. Altogether, the design is a good one.

Coverings for Hot Air and Other Pipes.

The manner in which the heat from house furnaces is wasted by radiation from the unprotected pipes in the cellar is within the experience of most persons who have used them. Many a good heater has been condemned and removed for insufficient heating, when the fault has been with the pipes, which, being, perhaps, long and exposed, wasted the heat to a considerable extent. Even in the case of heaters which answer their purpose in giving off sufficient heat to warm the house, there is often a loss of quite a high percentage of the total consumption of fuel from the unprotected pipes.

To prevent such waste of heat, it is only necessary to cover the pipes with an insulating material which will prevent radiation. The same protection may be given to hot pipes where they are located in close proximity to woodwork or other material liable to char or take fire. Mortars, felts, and various other materials have been used as protectors, with more or less success, but the organic matter which they contain has the effect of causing a gradual decomposition, and, moreover, conducts the heat to some extent, and is liable to the ravages of vermin.

Mineral wool is, perhaps, the best material that can be used for the purpose, as it resists the action of fire and water, is practically indestructible, and forms a most effective material for the prevention of the radiation of heat. Messrs. James F. Wood & Co., of Front Street, Wilmington, Del., and 133 North Second Street, Philadelphia, Pa., are the patentees and manufacturers of pipe coverings of this material, having a metal exterior, and being applied to the pipes without the use of paste or cement of any kind. Beyond their great utility as protectors, they have the advantage of being neat and regular in appearance and cleanly in application, while their high qualities of insulating heat render them of especial value in cases where it is required to convey the heat to a great distance, and where it would be almost entirely lost with unprotected pipes

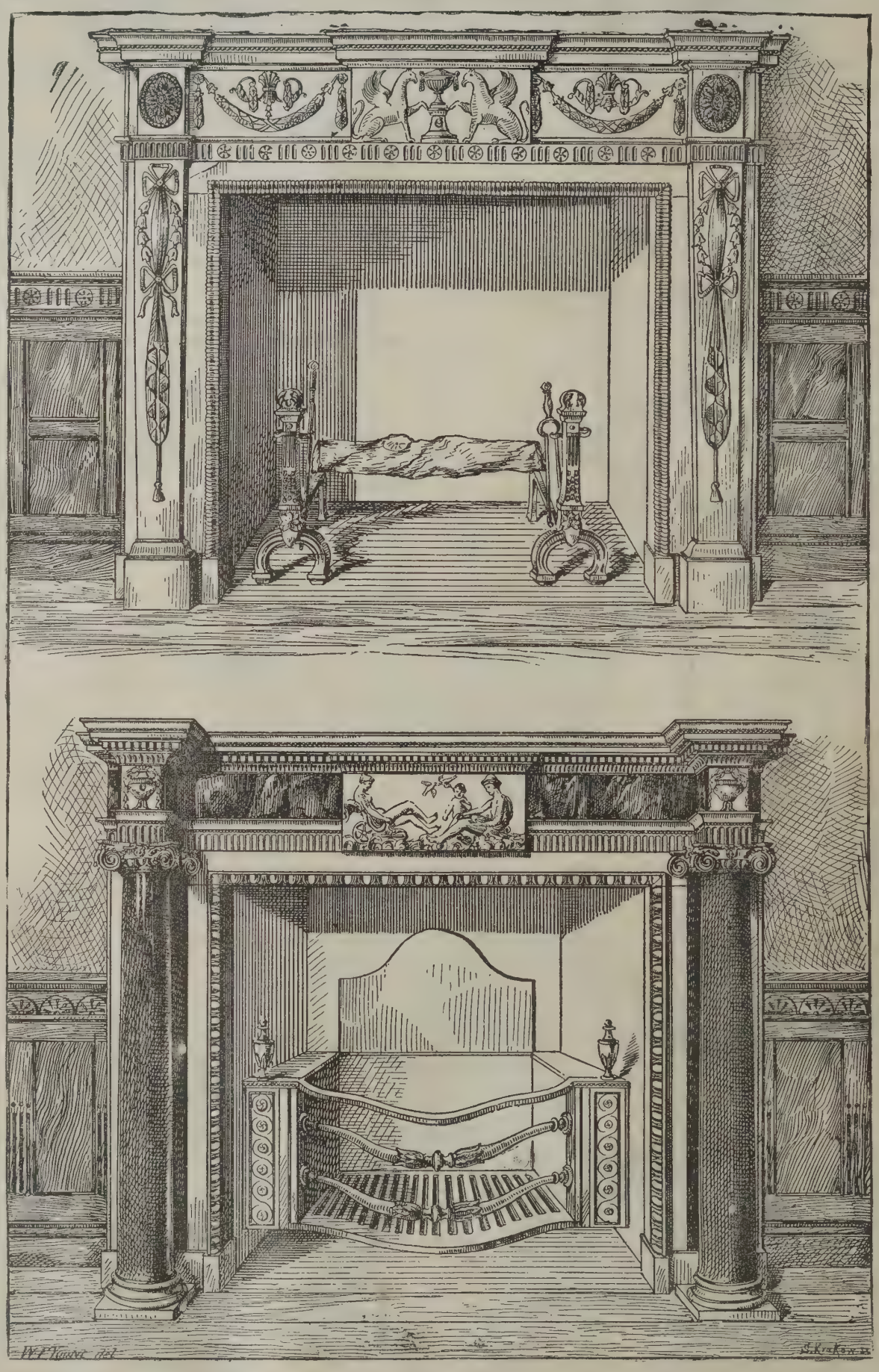
Water pipes located in exposed positions, where they are likely to burst from the water freezing, may be effectually protected by a covering of a good non-conductor of heat, and there are few better protectors for the purpose than those made specially of mineral wool by Messrs. James F. Wood & Co.

Rosewood Stain.

Take half a pound of logwood, boil it with three pints of water till it is of a very dark red, to which add about half an ounce of salt of tartar. When boiling hot, stain your wood with two or three coats, taking care that it is nearly dry between each; then with a stiff, flat brush, such as is used for graining, make streaks with a very deep black stain, which, if carefully executed, will be very near the appearance of dark rosewood. The following is another method: Stain your wood all over with a black stain, and, when dry, with a brush as above dipped in the bright liquid, form real veins in imitation of the grain of rosewood, which will produce, when well managed, a beautiful effect. A handy brush for the purpose of graining may be made by taking a flat brush, such as is used for varnishing, and cutting the sharp points off the hairs, and making the edge irregular. By cutting out a few hairs here and there, the grain may be imitated with great accuracy.

MANTELPIECES FROM OLD DUBLIN.

Our illustration is of two fine old mantelpieces from Dublin. They were made just prior to 1733, for the town house of Viscount Richard Molesworth in that city. They are both classic in design, worked in statuary marble, and are in excellent preservation. The mantel at the top of page is entirely in statuary, and has two pilasters at the sides, carved with wreaths of laurel leaves and drapery; the frieze has also carved swags of laurel, while on the projecting center are winged griffins guarding an urn. The bottom mantel is rather of a richer description, having two Ionic columns of Siena marble, and carved capitals. The frieze is also of Siena excepting the projecting center, which is of statuary, and is beautifully carved with figures representing Mars, Venus, and Cupid. The frieze has imitation dentils of Siena and statuary alternately. These mantelpieces have been carefully restored by Mr. Boucneau, of 48 Warren Street, Fitzroy Square, where they can be seen. As will be noticed, they are both in good taste and of noble proportions.—*Building News.*



TWO MANTELPIECES.

Wood oil is now being made in Sweden on a very large scale. It is abstracted from the refuse of timber cuttings and from stumps and roots in forest clearings. It cannot be burned in ordinary lamps, on account of the large amount of carbon it contains; but in lamps of special construction it is said to give an excellent light, and to be the cheapest of all illuminants.

The Greatest of Great Walls.

Says a correspondent of the *Milling World*, who has recently been traveling in China: Of course we had to go to the great wall of China. This country abounds in great walls. Her mural defenses were most extensive—walled country, walled cities, walled villages, walled palaces and temples—wall after wall and wall within wall. But the greatest of all is the great wall of China, which crests the mountain range and crosses the gorge from here some forty miles away. Squeezing through the last deep gorge and a deep rift in the solid rock cut out by ages of rolling wheels and tramping feet, we reach the great, frowning, double bastioned gate of stone and hard burned brick—one archway tumbled in. This was the object of our mission, the great wall of China, built two hundred and thirteen years before our era; built of great slabs of well hewn stone, laid in regular courses some twenty feet high and then topped out with large, hard burned bricks, filled in with earth and closely paved on the top with more dark, tawny brick—the ramparts high and thick and castellated for the use of arms. Right and left the great wall sprang far up the mountain side—now straight, now curved, to meet the mountain ridge, turreted each three hundred feet—a frowning mass of masonry. No need to tell you of this wall; the books will tell you how it was built to keep the warlike Tartars out—twenty-five feet high by forty thick, twelve hundred miles long, with room on top for six horses to be driven abreast. Nor need I tell you that for fourteen hundred years it kept those hordes at bay, nor that, in the main, the material used upon it is just as good and firm and strong as when put in place. Twelve hundred miles of this gigantic work built on the rugged, craggy mountain tops, vaulting over gorges, spanning wide streams, netting the river archways with huge hard bars of copper, with double gates, with swinging doors and bars set thick with iron armor—a wonder in the world before which the old time classic seven wonders, all gone now save the great pyramid, were toys. The great pyramid has 85,000,000 cubic feet, the great wall 6,350,000,000 cubic feet. An engineer in Seward's party here some years ago gave it as his opinion that the cost of this wall, figuring labor at the same rate, would more than equal that of all the 100,000 miles of railroad in the United States. The material it contains would build a wall six feet high and two feet thick right straight around the globe. Yet this was done in only twenty years, without a trace of debt or bond. It is the greatest individual labor the world has ever known.

Cross of Wheat and Rye.

A successful attempt at crossing wheat and rye is mentioned in Biedermann's *Centralblatt.* The grain capsules of the wheat were carefully opened, and the stamens removed before they were developed. The pollen from the rye was afterward placed upon the stigmas, and the whole head carefully tied up. The seeds resulting from this process were planted and readily germinated, producing plants that partook of the characters of both parent forms, though with those of the wheat predominating. Some of the ears had long glumes, while others had short ones. The seeds themselves showed a resemblance to rye, but less than to wheat.

A New Cement from Slag.

Selected blast furnace slag is, while it is in the molten condition, run into water, and is thereby reduced to a fine state of subdivision. To this finely divided slag, after it has been carefully ground and screened, a certain proportion of slaked lime, also passed through a fine sieve, is added, and the mixture is thoroughly amalgamated and ground together in an apparatus called by the inventors a "homogenizer"—an appliance consisting of a revolving drum, partly filled with a certain number of metal balls, resembling somewhat in its action the machinery often employed for quartz crushing. Here the lime and the slag particles are acted upon by the continuous blows of the numerous balls, and are crushed to an extremely fine powder. Moreover, their molecules are mechanically brought into the closest possible contact. By this means it is claimed that a "flowery, silky" powder is produced, capable of filling all the interstices in the materials to be aggregated better than the "sharp, sandy, and granular powder" of Portland cement. Indeed, it is asserted that this treatment will improve Portland cement made in the ordinary way. The process of "homogenizing," as compared with simple mixing, effects a vast improvement in the quality of the slag cement, its tensile and compressive strength being thereby almost doubled. This is the entire process of manufacture.

A $1,500 COTTAGE.

BY W. H. HARVEY, ARCHITECT, WORCESTER, MASS.

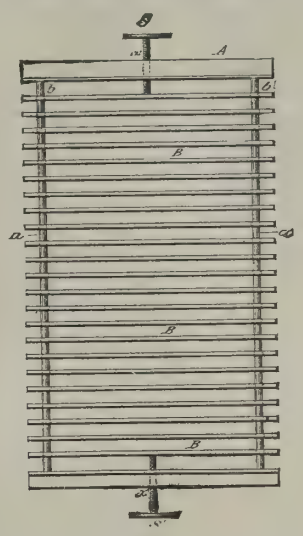
This cottage to cost about $1,500 as estimated by local constructor. The foundation is of stone up to grade line; the walls 20 in. thick, laid dry, and neatly pointed with mortar. The underpinning above grade of good, hard-burned brick, laid in lime and cement mortar, colored red. The chimney of round, hard-burned whole brick, laid in good mortar. The entire first and second stories lathed and plastered one coat, finished with a green skim. The outside finish of best second clear pine. Clapboards of sound spruce, and shingles of clear cedar. The gutters and conductors of cypress. The floors of sound local pine. The inside finish of well seasoned whitewood. Casings for doors and windows 4½ in., reeded with corner blocks. Bare plain beveled 8 in. wide stairs of whitewood; hand-rail of same, placed on iron brackets. All interior doors stock made, 2 ft. 6 in. by 6 ft. 6 in. by 1⅜ in. thick, with beveled rails and stiles and raised panels. All of exterior doors as per detail, with upper panels of stained glass.

All of the exterior to be painted two coats. All of the interior standing finish to be stained and varnished. Floors in kitchen, pantry, bath room, and closets painted. The plumbing comprises bath tub and closet fixtures in bath-room, cast iron sink in kitchen, and the necessary waste pipes and traps, etc., plumbed for cold water. The height of ceilings is: In cellar, 7 ft. 6 in.; first story, 8 ft. 9 in.; second story, 8 ft.; attic, 9 ft. to ridge. Attic not finished.

APPARATUS FOR PAINTING SHINGLES.

BY CLIFFORD I. MILLARD, OF BURLINGTON, IOWA.

The shingles to be painted are arranged between the bars, B B, so that their thinner end will reach about one or two inches above the bars. The rest of the shingles



are below the cross bars, B B. When the apparatus is thus filled with shingles, the cross bars, B B, are, by means of screws, S and S', pressed toward the center of the frame, A, until the shingles heretofore arranged between the cross bars are firmly held between the bars. Now the frame is ready to be moved to any suitable place, where the lower ends of the shingles are dipped to any desired depth into a vessel filled with paint or any other suitable material, and after this is done the apparatus, with the shingles, is put aside to dry. This dipping process may be repeated as often as desired. When the shingles are thus painted, the hold of the screws, S and S', upon the cross bars, B B, is relaxed, and the shingles drop from between the bars, and are now ready to be packed.

Errors in Planning Houses.

To the Editor of the Scientific American:

Please allow me space for a few words concerning the mistakes made in planning dwelling houses, in the location of plumbing, such as bath rooms, water closet, etc. I have before me several copies of your ARCHITECTS' AND BUILDERS' EDITION, and find the evil in several of the plans therein published, which give the plumber no chance to make the proper connections with water and waste pipes. Nine-tenths of the architects do not give a thought to plumbing in their plans, but locate it in any out of the way place, which makes it impossible for the plumber to do good work; and if the connections are not first-class, or there is a leak in any joint, the fault is put on the plumber, but not on the architect, to whom it rightly belongs. This necessarily incurs much more pipe and labor than it would if it was over the kitchen, which it should be. My theory is to plan a house so as to have the bath room, if there is one, over the kitchen, near the chimney, so that direct connection could be made with tank from which the hot water is taken, and also to place the sink in the kitchen in such a position as to have waste pipes from bath room and water closet to connect in the cellar. This would give the plumber a chance to get at his work and do a good job, and avoid the necessity of having a plumber running to the house every two or three months, which incurs expense as well as annoyance.

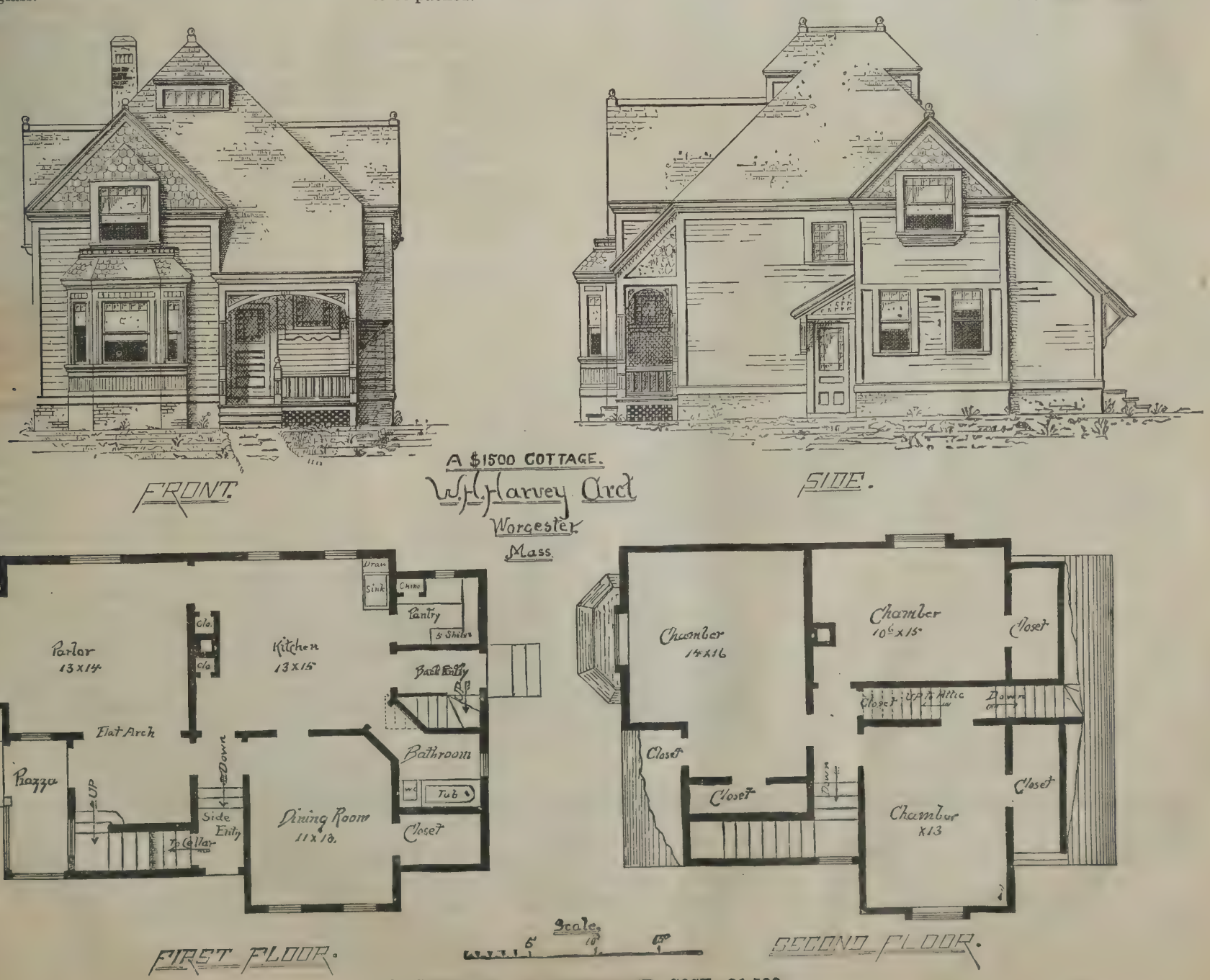
N. H. DECKER.

Newburg, N. Y.

Laundry Hints.

A spoonful of oxgall to a gallon of water will set the colors of almost any goods soaked in it previous to washing. A teacup of lye in a pail of water will improve the color of black goods. Napkins should lie in lye before being washed; it sets the color. A strong tea of common hay will preserve the color of French linen. Vinegar in the rinsing water for the pink or green calicoes will brighten them; soda answers the same end for both purple and blue. To bleach cotton cloth, take one large spoonful of sal soda and one pound of chloride of lime for thirty yards; dissolve in clean soft water; rinse the cloth thoroughly in cold soft water, so that it may not rot. This amount of cloth may be bleached in fourteen or fifteen minutes.

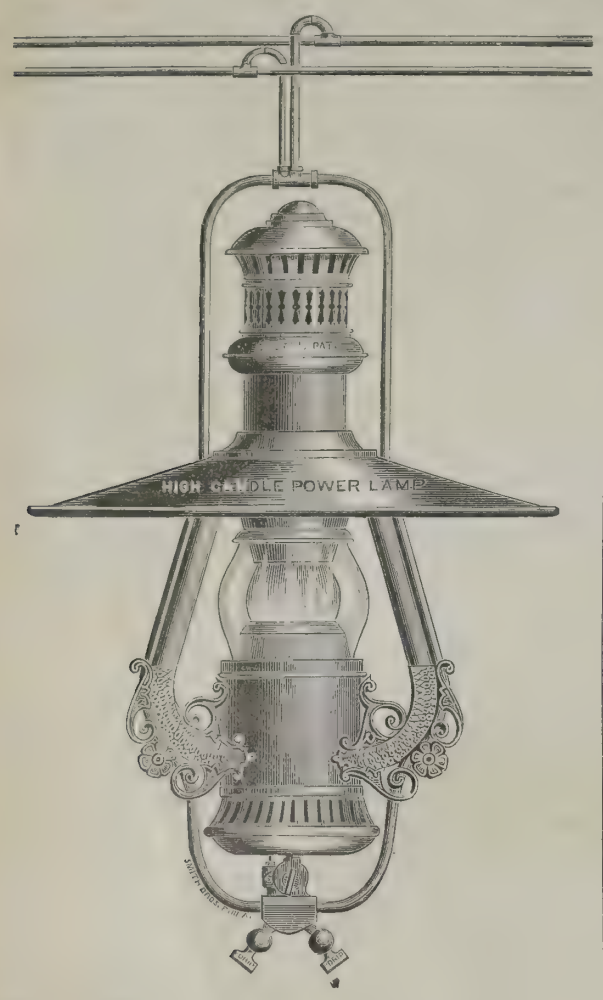
JAMAICA is said to contain about 500 species of ferns, or one-sixth of the ferns of the whole world.

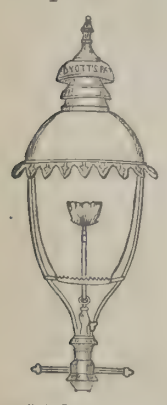


A COTTAGE OF MODERATE COST—$1,500.

GAS LAMPS FOR LIGHTING LARGE SPACES.

The competition between gas and electricity has proved of great advantage to the public, for while in most cases electricity for lighting purposes costs more than gas, the increasing use of electricity has stimulated inventors and manufacturers to the making of many improvements in the appliances for and methods of burning gas, whereby the cost is lowered and greater efficiency is obtained. An example of the means by which gas is thus more efficiently used for the lighting of large spaces is afforded in the illustration herewith of a high candle power lamp, such as made by the Standard Gas Lamp Co., of Philadelphia. By the use of such lamps as these, of 40 candle power and over, the place of the electric arc lamp is supplied, and a light is given which does not cast those heavy shadows which render a gas light so often necessary in addition to electricity. Then, too, the improved burners which are used with these high candle power gas lamps result in a great comparative saving of gas, which is thus more perfectly burned to give the maximum quantity of light possible. In connection with this method of furnishing light, the company use Dyott's patent system of instantaneous lighting and extinguishing gas lights, without electricity, by which one or one hundred burners can be instantly lighted or extinguished by turning one stopcock. This, of itself, renders it possible to readily save a large amount of gas; and where the system is used in railroad depots, where the full light is only required for a short time, on the arrival and departure of trains, the saving thus effected has been enormous. It is this fact, in connection with the economy of burning the gas in these high candle power lamps, which has led the Pennsylvania Railroad Company to adopt the lamps and system of lighting of the Standard Gas Lamp Company in their depots and warehouses.





THE NARROWEST HOUSES IN NEW YORK.

JOHN M. PAGE.

New York has scores of noteworthy buildings laying claim upon public attention because either of their architectural pretensions or their size. It is doubtful, however, if among them all there is any more curious than the one shown in the cut.

It is curious in being the narrowest building in New York. It covers a lot 102 ft. deep and only 5 ft. wide, and comprises two private dwellings. Of even width from front to rear, except for its bay windows, it may be safely pronounced the narrowest building in New York.

As one would naturally suppose, such houses must owe their existence to some extraordinary cause; and the story of the origin of this pair is of interest.

When Lexington Avenue was first projected, it was the intention of the city authorities that it should extend no further north than to the southern side of Hamilton Park. This park was one of the remnants of the old Jones' Wood, and was projected to cover a large square bounded by Third and Fourth Avenues, Sixty-sixth and Sixty-ninth Streets. The abandonment of the idea of devoting this land to the purpose of a public park accounts for its now being the site of such a number of large institution buildings, charitable and educational. After the abandonment of this park, Lexington Avenue was cut through to the end of the island, and many houses and pieces of land were distributed. Among others a certain lot on the northern side of Eighty-second Street, which was almost wholly absorbed, leaving only the strip of 102 ft. by 5 ft., which has since become the site of this uncommon building.

The owner of this strip then tried to buy the adjacent land in Eighty-second Street, a piece 95 ft. by 102 ft. But he and his neighbor could never agree upon the terms. The strip lay idle till the spring of 1882, when the owner of the inside property wished to build. In order that he might have a frontage on the avenue, he began to negotiate for the purchase of the narrow corner strip; but for no consideration would it eccentric owner give it up.

The upshot of these negotiations was that the latter vowed that he would never part with his land, and, moreover, that, worthless as it might appear, he would build on it, and more than one house at that. This presumably absurd threat he carried out to the letter, and with such alacrity that his two houses stood there before his neighbor could enjoy one single day's light through his side windows.

The subjoined plan shows how the lot has been divided crosswise into two equal sections, each 51 ft. by 5 ft. Of course, a really habitable house could not be built within lines so contracted; but from the plan it may also be seen to how great an extent the builder availed himself of the privilege granted by the city of making projections upon the city land, under the name of bay windows. It was solely by making these projections, and thus gaining in places an interior width of 7 ft. 3 in., that anything like a room could be obtained. In this way fully two-thirds of the area of each house is bay window.

The exterior is of red pressed brick of good quality, with white pointings. A white, rough-faced marble is used for the sills and arched lintels of the windows and doors, which are wholly destitute of side trimming. The only windows in the basement, which represents kitchen pantries and coal cellar, are plain round holes two feet in diameter, opening near the ceiling. On the ground and upper floors, the windows are of the most contracted size, and all the same. Those on the ground floor have white wooden shutters, while the others are without any protection but inside blinds.

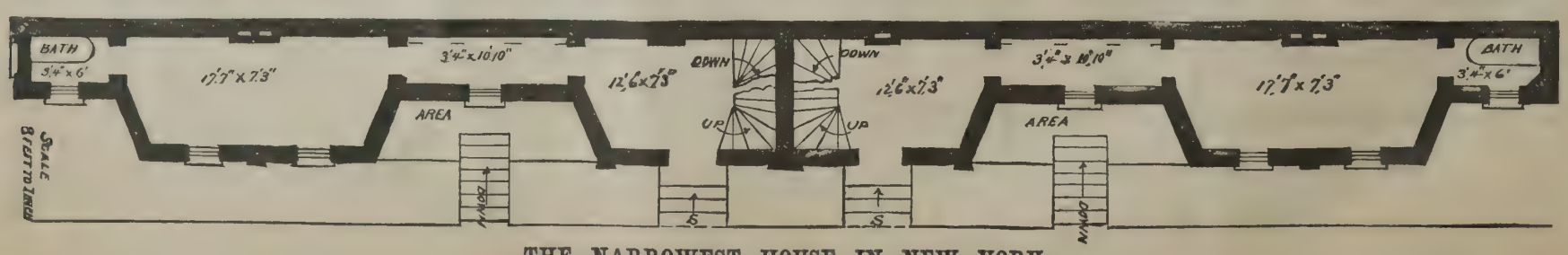
The great disparity between the narrowness of its side and the length of its front, together with the curious combination of building materials, give it an effect which, fortunately, can be seen nowhere else in the city. From the front project three broad bays to a distance of four feet. The middle one of these bays is evenly divided between the two houses, and contains the front doors. It is surmounted by a low gable, about eight feet below whose apex is a large stone forming the cap of a broad pier and bearing the date "1882." This pier and also similar piers in the middle of the side bays are ornamented with a stripe of alternately red and yellow terra cotta tiles. These tiles are the decorative features of the exterior.

The small street door opens into a marble floored hall 12 ft. 6 in. by 7 ft. 3 in. One end of this hall is occupied by the corkscrew stair which winds from ground to roof. Opposite the stair is an arched opening in the brick cross wall (none of the partitions are of wood) into a passageway 3 ft. 4 in. wide, in which for the first time the proper width of the house is encountered.

From the other end of this passage opens the solitary room, a space 17 ft. 7 in. by 7 ft. 3 in., or about the size of the average hall bedroom. From the extreme end of this opens a bathroom 3 ft. 4 in. by 6 ft. The heights of ceilings and interior finish is the same on all the living floors, as is also the plan; so that the uses of the rooms are left wholly to the discretion of the occupants. The basement interior is lined throughout with expensive enameled white brick, making it the best finished floor of the house.

There are no fireplaces on any of the floors, the only means of heating being by having a stove in every room. This difficulty of heating is said to be the only objection to the houses as residences.

In this way was the curious determination spoken of carried out, and better yet: ever since they were built, the wealthy owner has lived in the one on the corner.



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Spontaneous Combustion of Wood.

Mr. Braidwood, superintendent of the London fire engine establishment, stated before a committee of the House of Lords that by long exposure to heat not much exceeding that of boiling water, timber is brought into such a condition that something like spontaneous combustion takes place, and that it may take eight years for the heat from pipes charged with or used to convey steam, hot water, or heated air, laid among the joists of a floor, or in the heart of a partition, or elsewhere in a building, incased in timber, to induce the condition necessary to the actual ignition of the timber.

A Large Casting.

One of the largest castings for marine engines ever turned out has just been cast at Messrs. J. Black & Co.'s Portobello Foundry, Monkwearmouth, viz., a bed plate, etc., 21 ft. 6 in. by 16 ft., weighing 25 tons. It was moulded and cast complete in 21 working days, and the metal was poured into the mould from three ladles, containing twelve, ten, and nine tons respectively, in one minute and fifty seconds, without a hitch.

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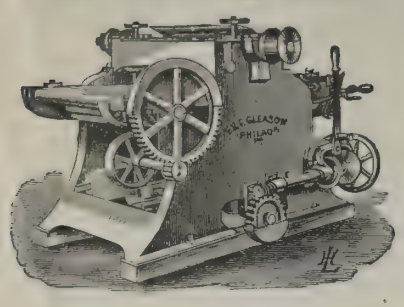

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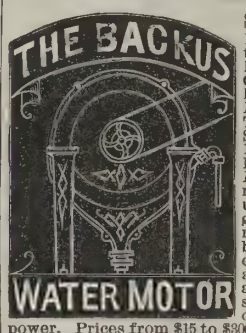

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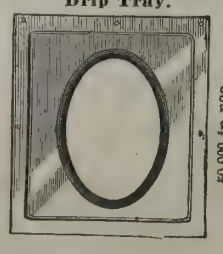

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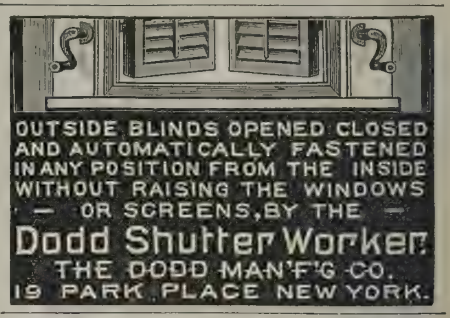

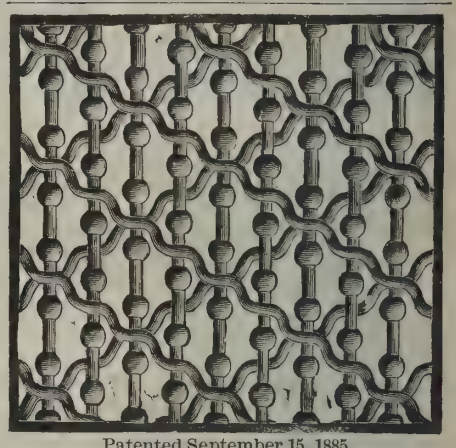

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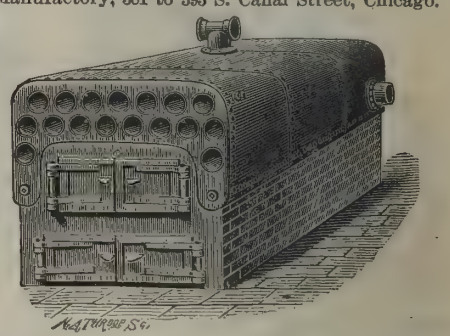

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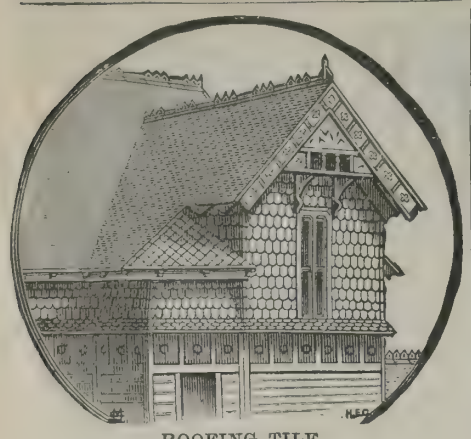

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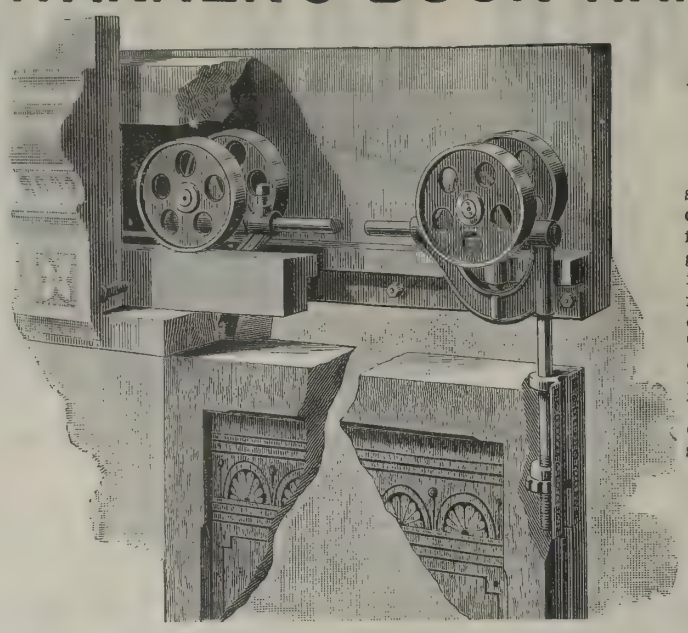

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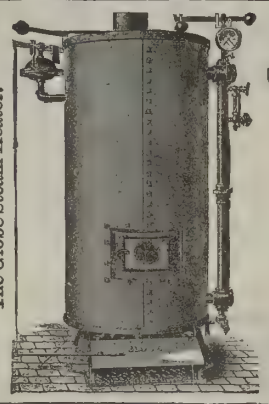
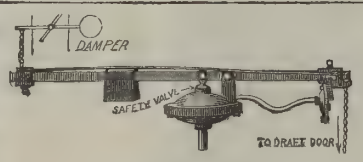


The Globe Steam Heater.



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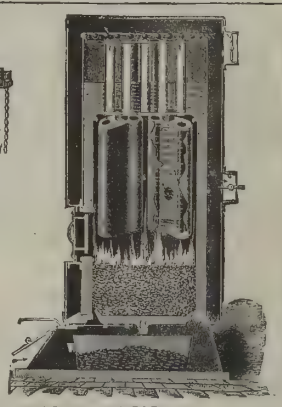

Sectional View of Globe Steam Heater.

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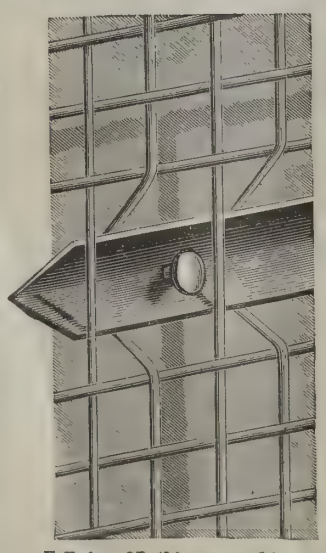

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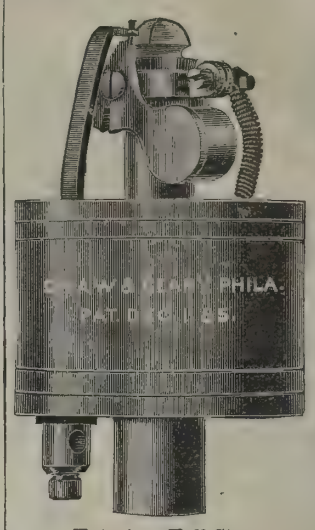

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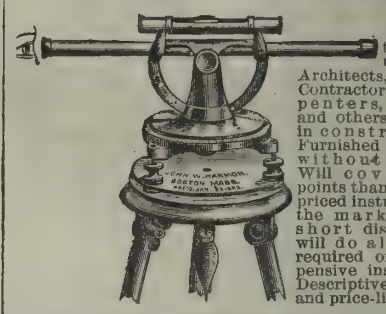

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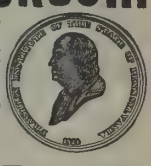

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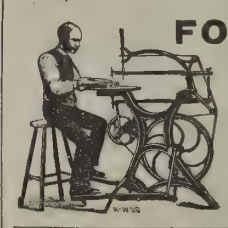

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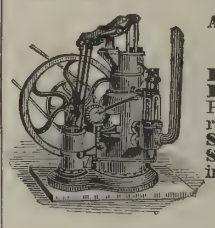

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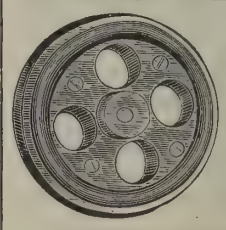

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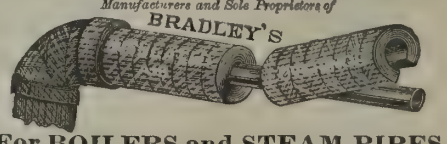

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) H. C. W. says: Will you be kind enough to give me a formula for plastering for a dining room? I want a plaster which will finish rather rough and be suitable for decoration in oil colors, and be extra durable. At the same time, if not too much trouble, will you kindly give a formula for a first class rough finish plastering in solid tint—*café au lait*, for instance—and say if you think the latter method would be as satisfactory as painting on rough finished walls. The work is to be done in a frame house. A. After the scratch coat, or coat with the hair in, is nearly dry, apply an ordinary second coat, such as is used previous to the hard finish, well gauged up with plaster, according to the hardness of the wall desired. The sand in this coat will give the requisite roughness, or if you desire it still harder, add one-third cement to the mortar. This mortar can be colored *café au lait* by adding yellow ocher and burnt umber, previously ground in water and mixed thoroughly with the mortar before the plastering is done. Evenness of tone is obtained by thorough mixing. Try a small quantity and let it set and dry first, in order to determine the tone. The better way, however, is to stain your wall with calcetine, or with any of the prepared calcimines which are sold dry and are ready to mix with hot water. Flatting in turpentine colors makes the best job, as the oil hardens the plaster of Paris in the mortar.

(2) S. D. B.—The safest method of removing varnish from woodwork without injury to the wood is to rub it off with a piece of soft rag soaked in methylated spirits, taking care to rub the way of the grain.

(3) H. L. H. would like the receipt for finishing oak in the antique style. A. Either bichromate of potash dissolved in water or liquid ammonia, applied to the surface of the oak with a brush or rag, will have the effect of darkening it in the same manner as is induced by age.

(4) E. S. asks: Is there any preventive of the disfiguring white incrustation which so often appears on brickwork? We have just erected a handsome brick structure, and already there are some signs of its appearance. Can you recommend any application which, while not injuring appearance of brickwork, would prevent above trouble? A. The incrustation on your brick wall is sulphate of magnesia. Sometimes a cure may be effected by applying, with a sponge, a solution of common muriatic acid, ½ pound in a pail of water; but, if this fail, nothing can be done excepting to brush it off from time to time as it appears. It will eventually exhaust itself.

(5) W. R. X. asks for a solution for waterproofing canvas horse and wagon covers that will be flexible. A. Take boiled oil fifteen pounds, beeswax one pound, ground litharge thirteen pounds; mix and apply with a brush to the article, previously stretched against a wall or a table, washing and drying each article well before applying the composition.

(6) N. S. C. asks how to color water in alcohol so as to obtain the deepest hue (red preferred), suitable for exhibition, in capillary tubes or thin layers. A. Use aniline red, soluble in water.

(7) F. P. L. asks: 1. Of what materials is the composition composed on picture mouldings? In what proportions are they mixed? How are they moulded in shape? How is the white grounding composition mixed and applied? A. Dissolve 1 pound of glue in 1 gallon of water. In another vessel boil together 2 pounds of resin, 1 gill Venice turpentine, and 1 pint linseed oil; mix and boil together until water has disappeared, when add finely powdered whiting until mass is of consistency of putty. This is hard when cold and soft when hot. It can be moulded in plaster of Paris or glue moulds. The white base seems to be mason's hard finish. It would be advisable to drive brads or tacks where the high parts come to be bedded in the composition, and hold it in place.

(8) G. Z. asks (1) how to kill or keep roaches away? A. Use borax or Persian insect powder. These must be renewed frequently, as they deteriorate by exposure to the air, and lose their power. 2. How to remove printer's ink from a tin can? A. Use benzine or caustic soda.

(9) W. W. W. asks if there is any preparation which, applied to windows, will prevent their frosting. A. Covering the glass with a thin coat of glycerine is the simplest method; where there are objections to this, make a double window, with a ventilating chamber between the glass walls.

(10) W. S. H. writes: The architects of this country (Utah) claim that roofs covered with tin sweat, thus causing the tin to rust, and to prevent this they advise a coat of paint to be put on the bottom of tin before laying. Now, I would like to know if the lumber does sweat, as it is a great hindrance to tinners to paint before laying. A. It is not the lumber that sweats, but the condensation of water from the moist air in the room upon the cold roof—exactly the same phenemenon as the sweating of an ice pitcher. Your remedy of painting may save the tin from rusting, but will not entirely stop the condensation and dropping of water. A ceiling is the best. Thick roofing felt tacked to the roof sheathing and fitted snugly between the rafters will make you comfortable.

(11) C. K. asks: Will a kerosene oil heating stove radiate more heat with a heating drum on than without? If there is a certain amount of heat in a gallon of oil, how can it be augmented by a drum? A. When the heat of the flame is communicated to the drum, the radiating surface is increased, and the same amount of fuel is rendered more effective, owing to the superiority of the iron over air as a conductor and radiator of heat.

(12) B. W. B. asks: Which plan is the most efficient for heating workshops—steam pipes around the walls at the floor, or steam pipes overhead just under the ceiling? A. In workshops and factories where the side walls are clear for the reception of pipes, the wall coils near the floor are the most efficient, and generally preferred for equal distribution of heat. There are many workshops and factories in which the wall spaces are occupied with machinery, benches, or goods. In such the hanging system is much in vogue, and is considered very efficient.

(13) "Information."—A structure along or over a marsh is often more correctly styled a causeway than a bridge. The Tay Bridge, Scotland, is 3,600 yards long. A railroad bridge over the Volga is 1¾ miles long. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 256. The Garabit in France is 413 feet high. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 391. The Kinzua viaduct is 301 feet high. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 369. The St. Gothard tunnel 48,840 feet long. The Mt. Cenis tunnel 37,849 feet long.

(14) H. A. W. writes: 1. A house is infested with red ants. How can they be removed? Powdered borax and Cayenne pepper have been used without effect. A. A strong solution of carbolic acid and water poured into holes kills the ants it touches. Lime and chalk are also recommended. 2. What will prevent grass from growing between the bricks in a side yard? A. Use common salt in the crevices.

(15) E. W. asks a receipt to make a cement that will stand considerable heat after it is cooled. A. Mix a handful of quicklime in 4 ounces of linseed oil; boil to a good thickness; then spread on thin plates in the shade, and it will become exceedingly hard, but may be easily dissolved over the fire, and used as ordinary glue.

(16) W. B. asks for receipt for flour paste that will not sour under a reasonable time. A. Mix smoothly flour and water till a thin batter is formed; put in a pinch of pulverized alum, and pour in boiling water until a thick paste is formed. Let it boil a minute or two; add a few drops of carbolic acid or oil of cloves. Put in a wide necked bottle. The oil of cloves acts as a germicide, and prevents the growth of mould.

(17) B. B. asks (1) how to dye or stain white and faded stag horn or buck horn to black. A. 0·14 ounce of silver is dissolved in 2·1 ounces nitric acid (aqua fortis). This solution must be applied several times to the article to be stained, but it is absolutely necessary that one coat should be dry before another is applied. 2. To a dark red color necessary for coloring knife handles? A. Take 17·5 ounces red Brazil wood, and boil for 1 hour in 4·4 milk of lime, and filter through a cloth. The articles to be stained are boiled for an hour in a solution of 1 ounce alum to 17 ounces water. They are then placed in the dye, and allowed to remain until the desired color is produced.

(18) P. H. asks: What is the best method and simplest for putting ebonized finish on small work-table? A. The stain is produced by successive applications of a decoction of logwood, followed by one of copperas; the article is then French-polished and rubbed up with oil and spirit.

(19) B. D. asks how to preserve some mole skins without injuring the fur—an easy method. A. Supposing the skins are dry, they should be softened throughout by soaking in pure water; soft water is best, but any ordinarily pure water may be used, and care must be taken that the skins are thus soaked only a sufficient time to soften them. Then clean off any bits of flesh that may remain on the flesh side, rinse all well, shake off the loose water, and gently stretch out and tack on a board, flesh side up. Then sprinkle with a mixture of powdered alum and salt, about two-thirds alum and one-third salt, enough to just cover every part. As the skin dries it takes up the mixture, but if any be left on the surface the second day, sprinkle on a little more water, otherwise put on more alum and salt, and sprinkle. Two to three days should be sufficient for such small skins, the idea being to give the skin all of the alum and salt it will take up, while in a moist condition. This tawing process makes the hair firm, a gentle rubbing and beating softens the flesh side, and it is preserved from decay, although tawed skins are never calculated to stand much wetting. This process is well adapted for all small skins, although those which are heavier require more time, and the flesh sides are sometimes folded together, and the skins rolled up. When the skins are freshly taken off, no soaking is needed, but more care is then called for in thoroughly washing off and cleaning them, and the first application of salt and alum should be in the proportions of one-half each. It requires the judgment of a tanner to deal with skins in a dry state which may have become partly damaged before drying, and it requires special knowledge also to tell whether a dry skin is so damaged.

(20) L. S. B. desires a receipt for making a good black lacquer. A. Take of burnt umber 8 ounces, true asphaltum 3 or 4 ounces, boiled linseed oil 1 gallon; grind the umber with a little of the oil; add it to the asphaltum, previously dissolved in a small quantity of the oil by heat; mix, add the remainder of the oil, boil, cool, and thin with a sufficient quantity of oil of turpentine.

(21) D. W. McD. asks how to restore rancid butter so that it will taste and smell well. A. Wash well first with some good new milk, and next with cold spring water.

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Any person having a new invention may, without charge, consult MUNN & CO., Scientific American Office, 361 Broadway, New York, for advice how to obtain a Patent or Caveat. Our Hand Book of Instructions relating to Patents sent free.

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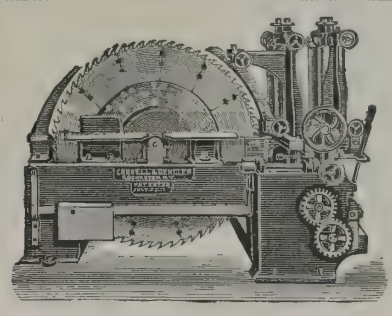

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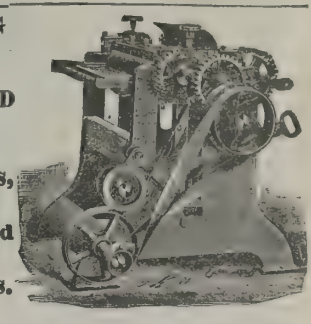

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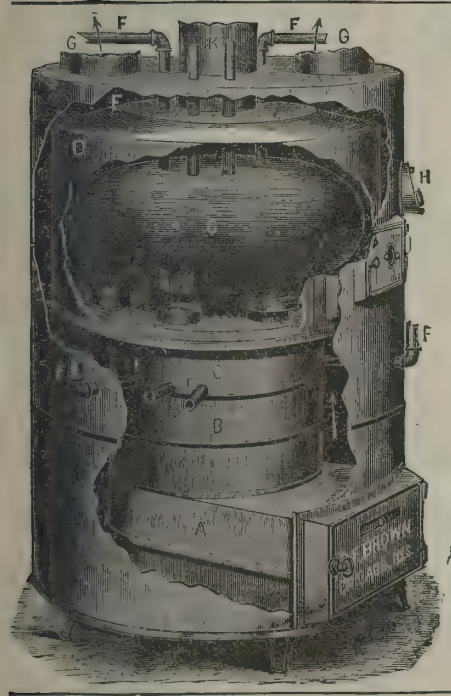

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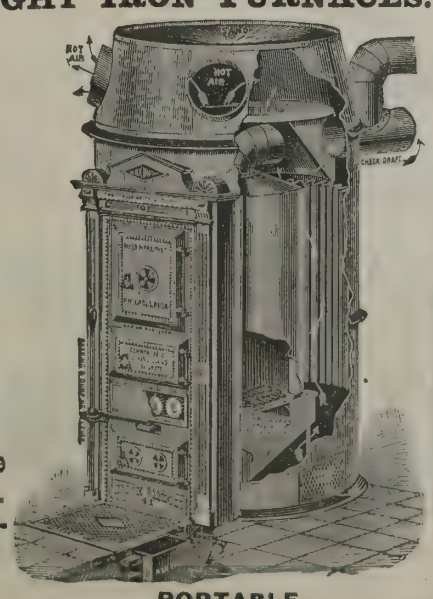

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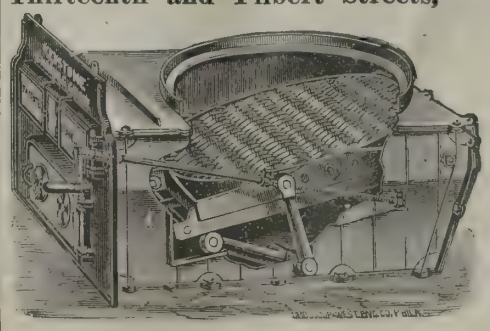

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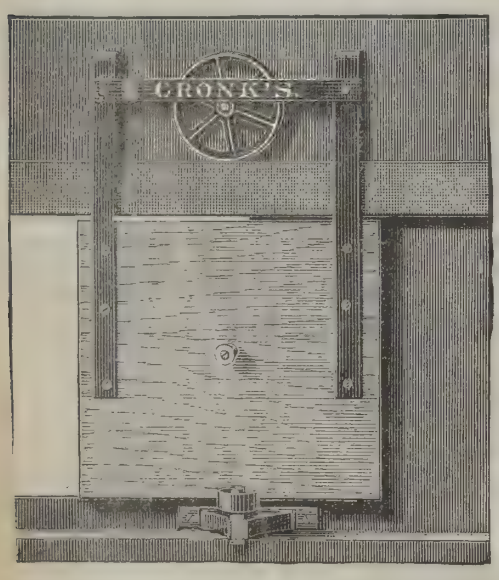

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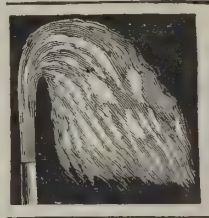

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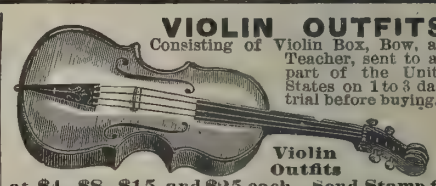

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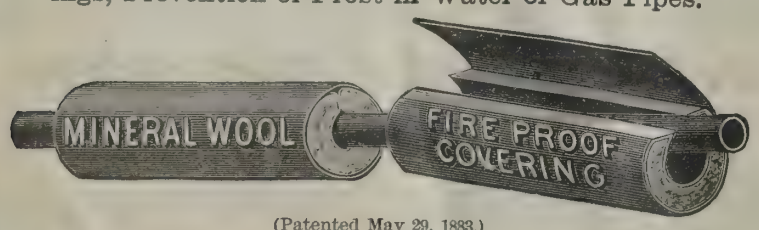

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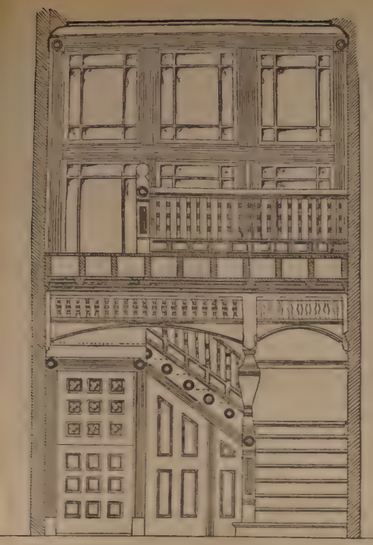

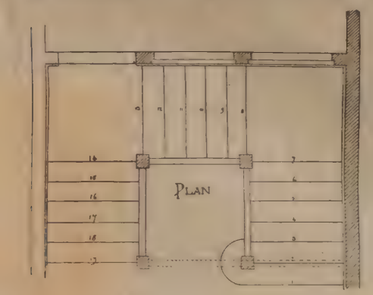

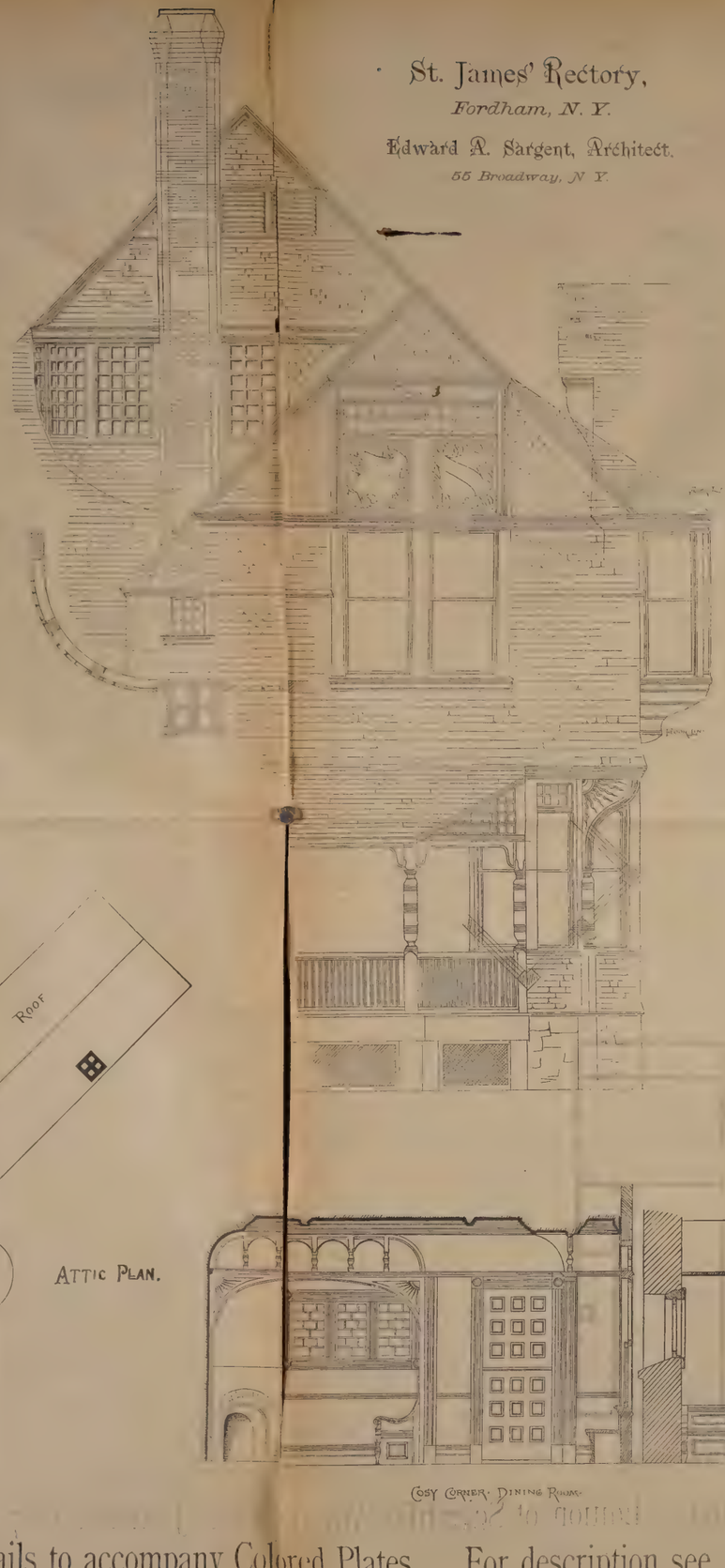

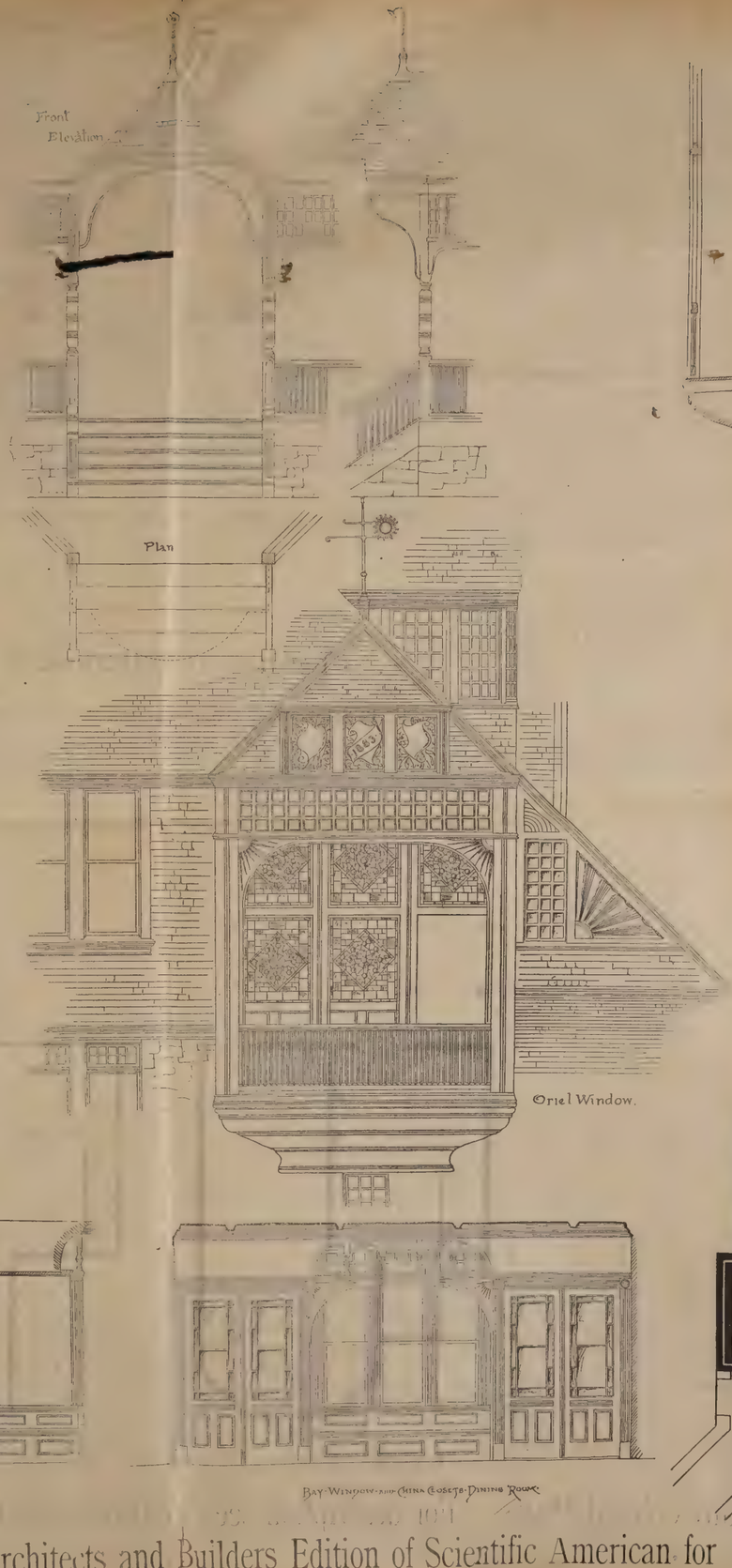

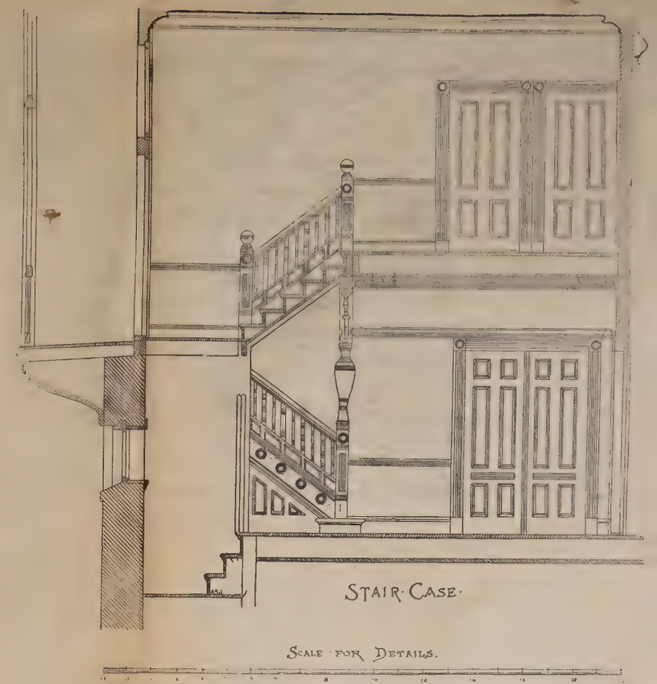

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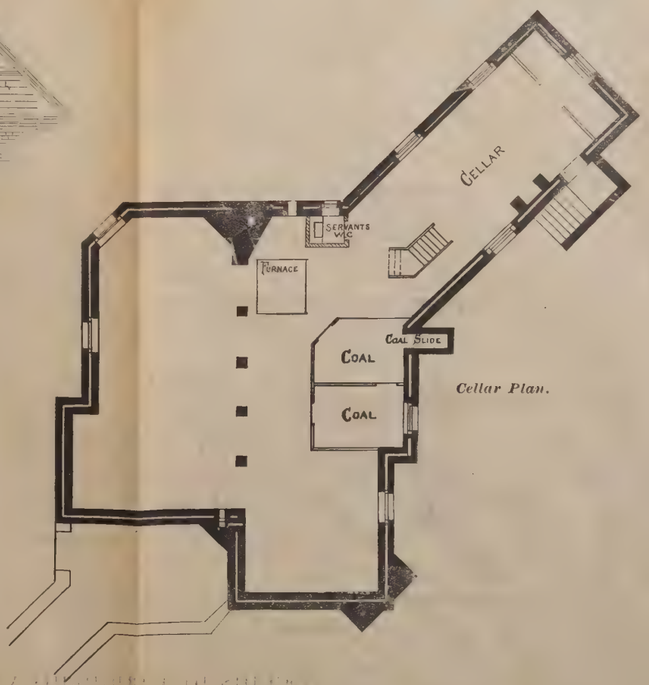

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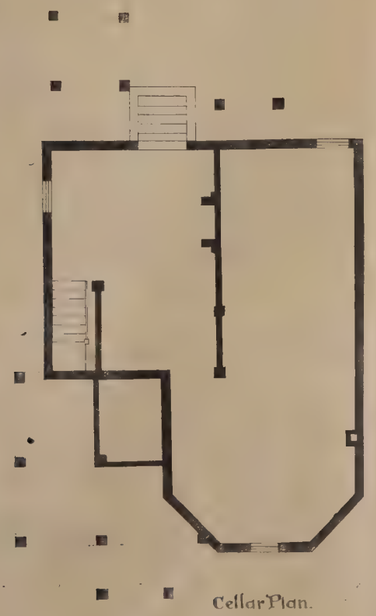

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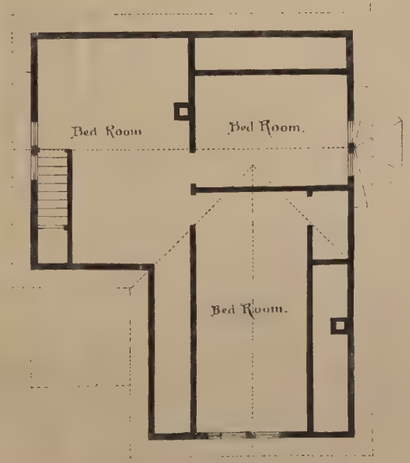

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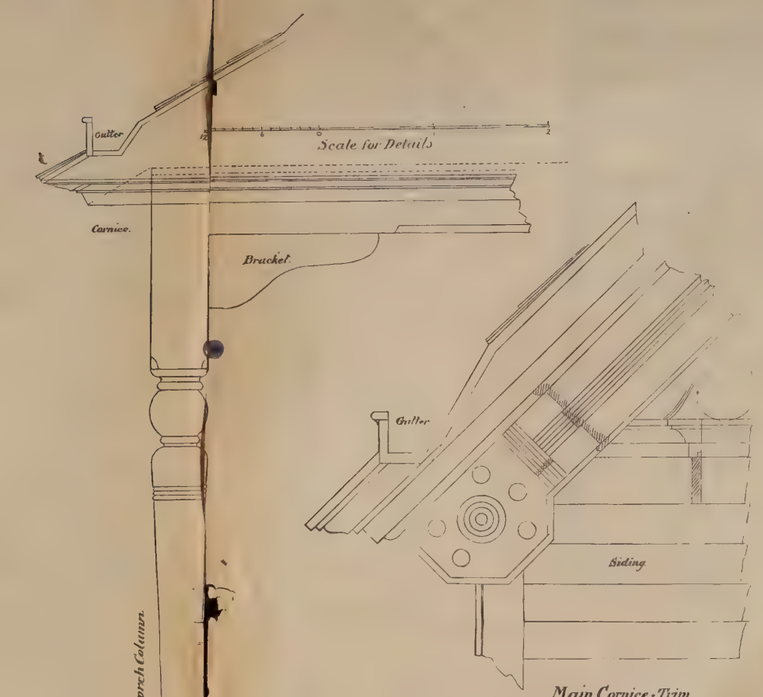

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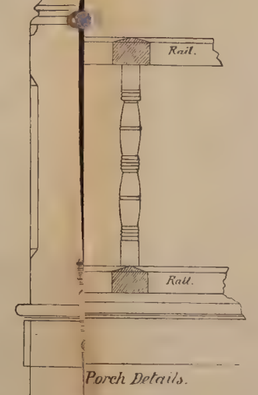

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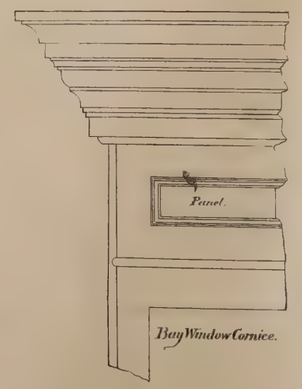

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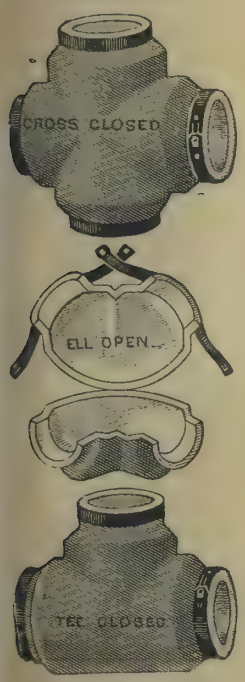

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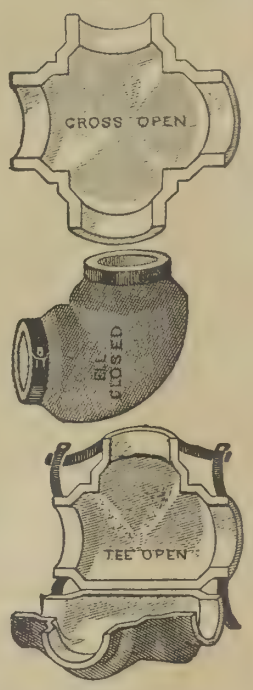

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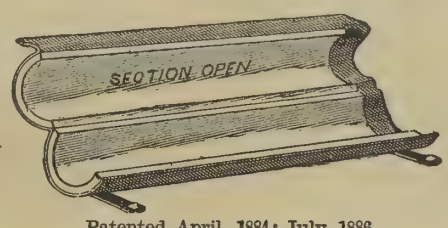

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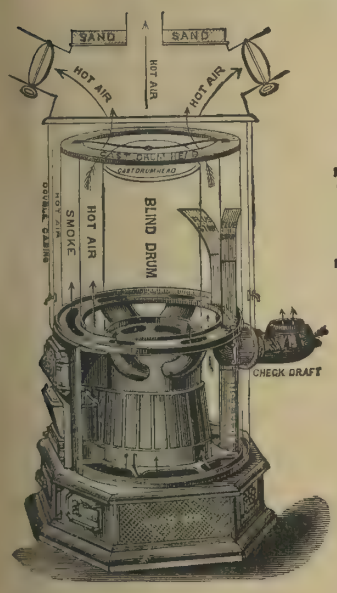

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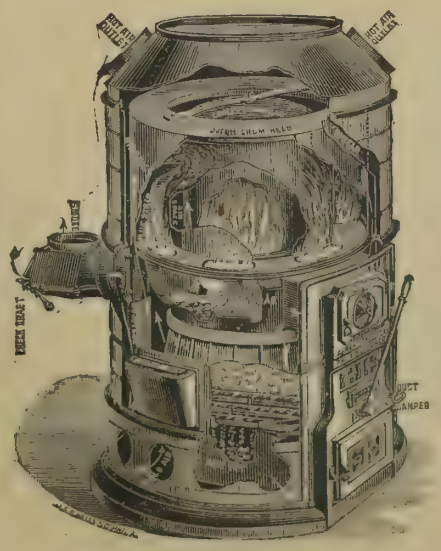

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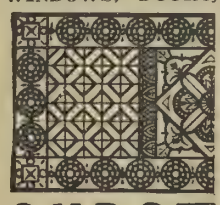

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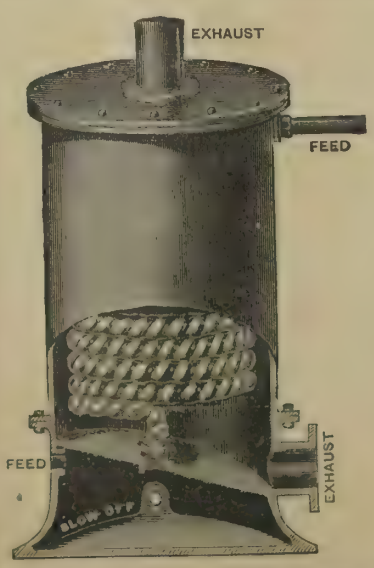

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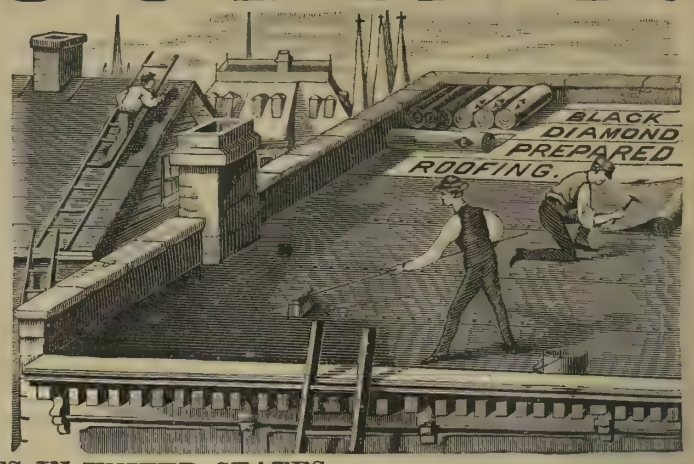

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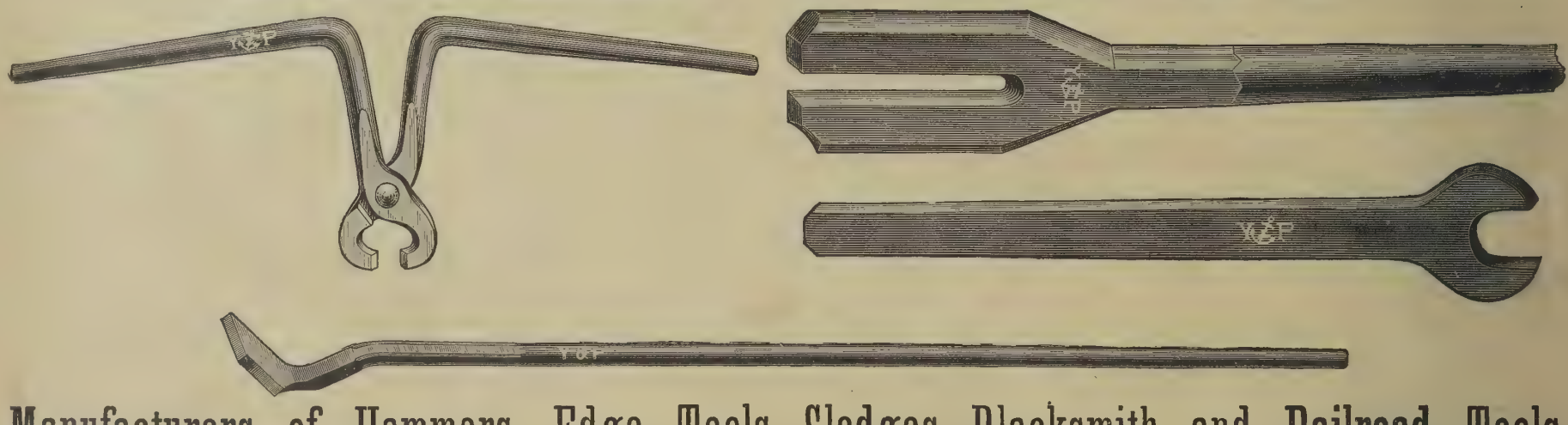

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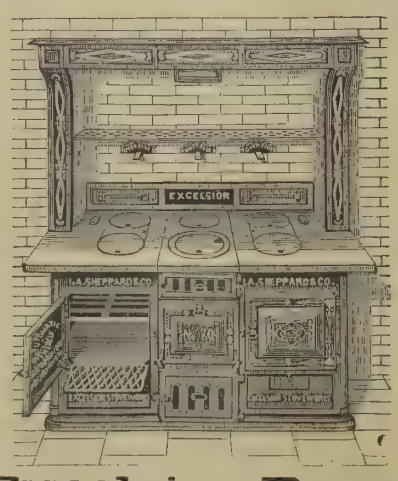

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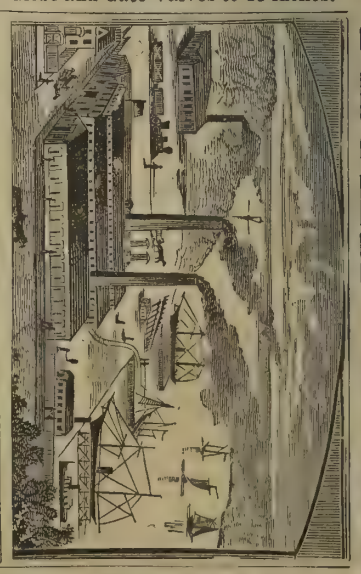

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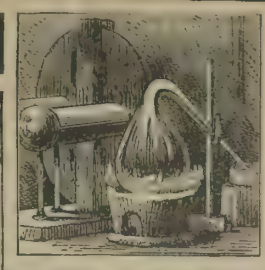

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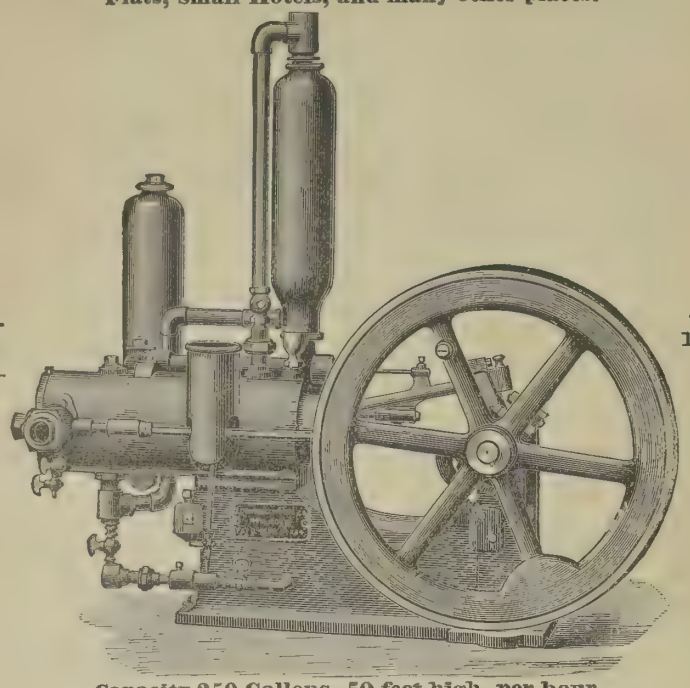

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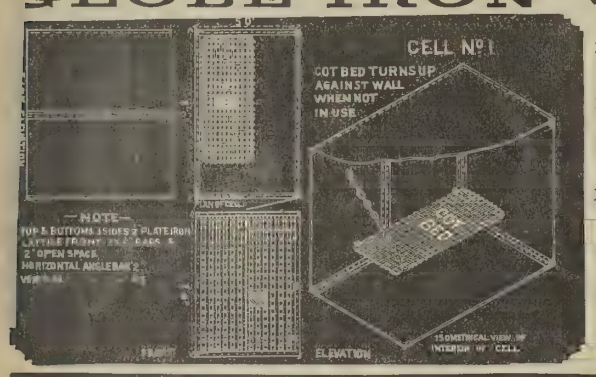

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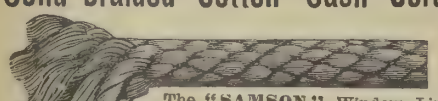

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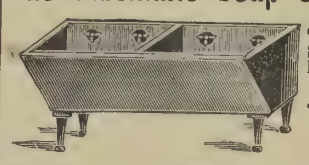

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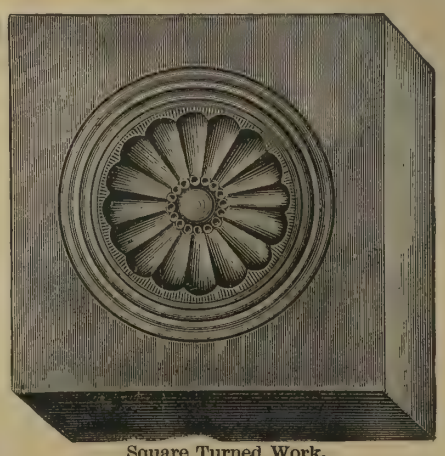

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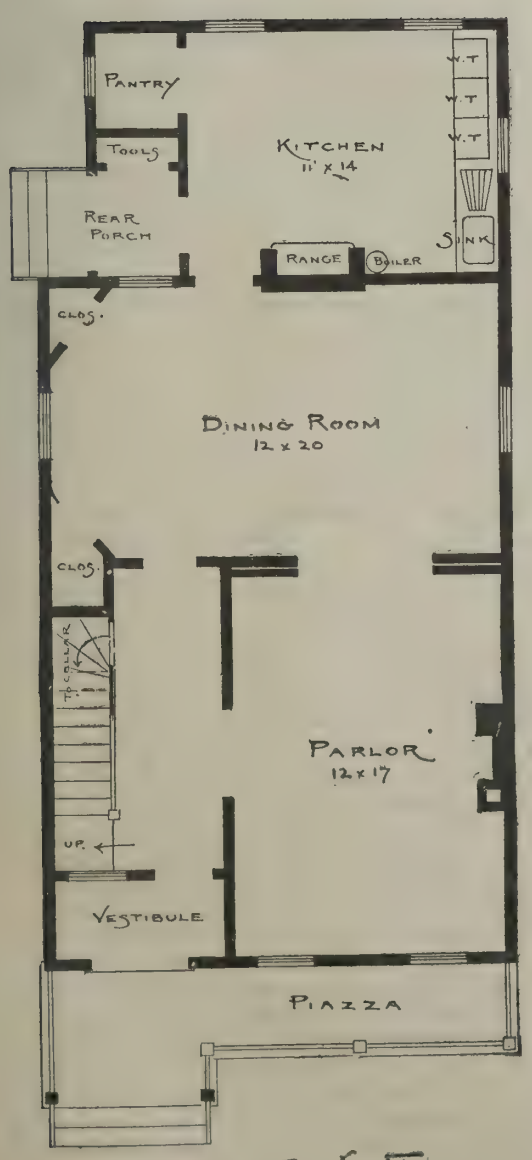
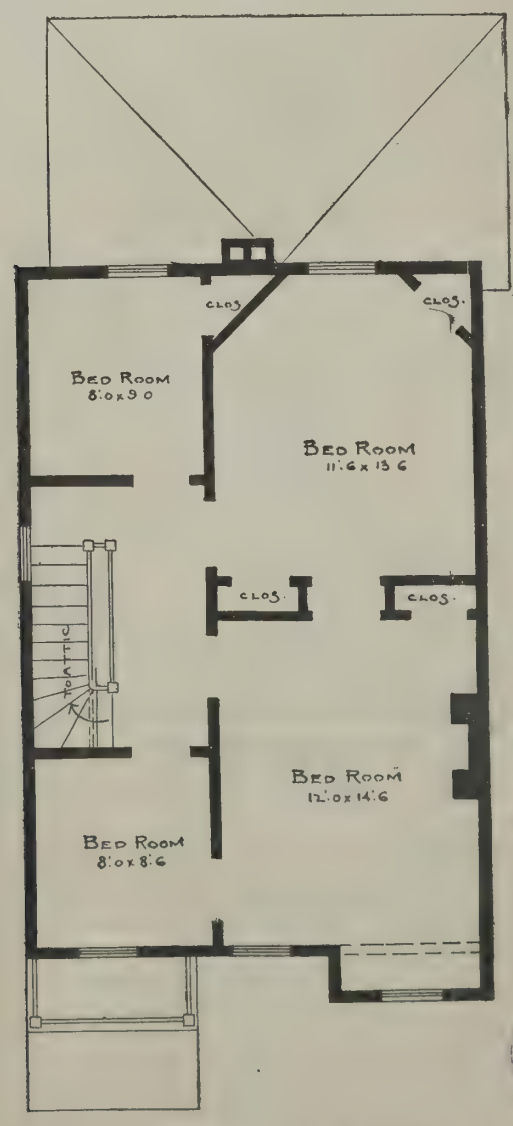


First Floor.



Second Floor.

A $2 600 COTTAGE AT EAST NEW YORK.—CHAS. E. HEBBERD, ARCHITECT, NEW YORK.—[See page 26.]

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At present we are able to supply to new subscribers the back numbers of this journal from its beginning in November, 1885. Each number is accompanied by a sheet of colored plates and a sheet of details.

[CONTINUED FROM PAGE 2.]

THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

In this city, through the munificence of Mr. Willard, a trust fund of $80,000 has been bequeathed to the Metropolitan Museum of Art, for the purpose of establishing an architectural collection. The scheme has been approved by prominent museum authorities, archæologists, architects, and many others whose knowledge and experience qualify them to express an opinion.

Even the best of modern museums, though scientifically planned and connectedly arranged as to sculpture, painting, and the industrial arts, fail to give architecture the space and thought it so richly deserves.

In founding this collection he wished to do all in his power to cultivate and encourage a popular taste for it, to help such students as were unable to secure the advantages of travel, and to elevate the standard of American work by presenting choice selections of the masterpieces of all styles.

He desired the collection to tell a clear and graphic story of the progress of the art, from the earliest period to the time of the Renaissance. No important type was to be slighted; neither was the collection to consist merely of fragmentary bits of detail. It should present all the distinctive styles in historical sequence, and in such manner as to show their inter-relationships and transitions. It should comprise carefully made, good sized models of typical buildings, casts of doorways and other minor architectural features, and a complete collection of casts of applied ornament, sculpture, and architectural detail, sets of photographs, and plain or tinted illustrations and engravings. An effort will be made to form a complete collection of scale models. They must be made to order, are expensive, must be accurately detailed, and time will be required to obtain them.

Chances of acquiring valuable collections of originals are rare, but the collections of casts have a completeness and a unity not found possible in museums of originals. It is not expected that the sum already raised will enable the trustees to make a complete selection of such examples as they wish to obtain, but it is such a long stride in advance of anything heretofore done of such a nature, that it is worthy of a wide and general recognition.

To the general public the collections of art objects in our museums are too often regarded as mere repositories of curious things. To attain their greatest usefulness, and tell the story of their creation, they should become more and more illustrative of the principles they were designed to enunciate, by becoming more closely connected with the courses of study in our academies, colleges, and other seats of learning.

The attitude of the general public toward our museums is a reproach to American culture.

In a most interesting manner was told the story of the founding of the American School of Archæology at Athens.

To an architect, Greece is the idyllic land of the past, and her art the perfect expression of the noblest inspirations that ever moved the heart of man. It has been, until lately, the most inaccessible country of civilized Europe. There is no overland route to Athens. Until within a few years, no facilities or opportunities have been afforded for the study of Greek art upon Hellenic soil. Four art schools are now flourishing at Athens, viz., British, German, French, and American.

An effort was made some four or five years ago to establish an American school on Grecian territory, where American students could make a study of history, literature, sculpture, archæology, and architecture.

The director who had charge of the school was at first supported by a yearly contribution of two hundred and fifty dollars from each of the ten leading colleges. This number was augmented to sixteen. An effort, however, has been made to secure $100,000 as a permanent endowment fund. Through the efforts of James Russell Lowell and others, twenty-five thousand of this amount has been subscribed. It is believed that the remainder will be obtained this winter.

The Greek government offered to donate a plot of land to the American school, if the managers of the school would erect a building. The land obtained adjoins the plot of ground given to the British school on the same conditions.

The two schools have similar courses of study. The requirements to enter each are equally severe. The management of the two schools have a good understanding of one another's aims and purposes, and perfect harmony of thought and action prevails. When lists of books, manuscripts, or prints that are wanted are sent on to London for the British school, care is taken that nothing contained in the American school is duplicated, and *vice versa*, so that the meager funds of both institutions shall go as far as possible. The students of either school share alike the advantages of both schools, and, in fact, the arrangement may be said to be on the English university plan, in which the individuality of the schools is kept distinct, yet are so managed that they possess the identity of a common interest. We learn that a fortunate circumstance has happened in connection with the future usefulness of these schools. Mr. Penrose, who is one of the most prominent of British architects, has been sent from London to take charge of the British school. His wisdom and experience will greatly benefit both schools, and will give a new impetus to their work.

In architecture the work of these schools consists in studying, sketching, and measuring the remains of Grecian art wherever it can be found. The explorations now going on at Assos are noted and recorded. Chiefly, the present state of knowledge of Grecian art has been derived from casts and fragments of original pieces, removed from their surroundings to a foreign country, where all the conditions and circumstances are changed. No one, no matter how great his genius, can gather from a fragment under the murky skies of London, for example, that refinement of light and shadow, that mystery of outline, which the Greek artist or sculptor loved to design, and whose effects could be studied only under his own unrivaled sky and atmosphere.

America is not the place to interpret Greek art. In this country traditions have no sacredness, and history is being made, not studied. To the average American, antiquity is a myth, or at the best a creature of the imagination. The student, however, is urged to visit Greece, to let the past perfect art tell its own simple, immortal story; to return, bringing with him something of the spirit which has wrought such masterly work, the admiration and the despair of all the ages.

Among the items of interest discussed in the trustees' report was an account of the preparation of an act to regulate and improve our federal architecture. A committee was appointed to confer with the supervising architect to draft such a bill.

The present unsatisfactory condition of the tariff in connection with the importation of designs, models, casts, photographs, books, etc., was declared to be in abeyance and unsettled.

As we cannot originate the classic designs of the old world, nor manufacture photographs of antique art which we do not and never can possess, it does seem an absurdity to embrace them in our tariff. In such matters protection is exclusion. A better order of things is now upon us. The Fairchild decision in regard to drawing the line between antique and modern art at the beginning of the eighteenth century is a marked step of progress. It is believed, however, that this special decision applied to paintings only; but that it will eventually include works of art of every name or nature, there can be no reasonable doubt.

It has been said of us as a people that we are so determined to have something new at all hazards that the question is not asked, To what epoch does the style belong? but this: Is it new? We take from here and there, and appropriate a noble cornice, adopting some happy Moorish diaper work for the background of a pediment, select a Romanesque archivolt for a Grecian doorway, and in many other ways ransack the storehouses of antiquity to make a heterogeneous mass, and in the virtuous admiration of our own astounding genius, we have learned to call it eclecticism.

This idea of piracy in art matters is not new. When the Romans conquered Greece, they carried away many valuable art treasures, and the artist too; but this action of the Romans has been explained by the admission that they were too practical and busy a people to study art. They saw what they wanted and by the right of might they took it, but must we make the same admission, and be Vandals too?

(To be continued.)

PRESSED WOOD ORNAMENTS.

Will you please answer in your February number of the ARCHITECT AND BUILDER how pressed woodwork ornaments are made, also artificial ornaments?

E. H. SMITH.

Los Angeles, January 12, 1887.

Answer.—Pressed wood ornaments are made in three ways—on end wood, on plastic veneers, and on a composition of veneers and sawdust.

The end wood is turned up to about the general shape desired, and then forced by hydraulic pressure into steel dies.

Plastic veneers are made by laying shavings of the wood to be pressed side by side until the surface wanted is covered, and then gluing to this first layer several other layers running either in the same direction or transversely or at right angles until the requisite thickness is made up. The veneer thus made is kept moist until ready for stamping between a male and female die, the male die being reduced so as to allow the veneer to enter the mould. The first pressure shapes it up, the shape is then covered with another layer and is finished by two or more pressures, the pressure being retained by suitable mechanical appliances until the glue has set. This work is very solid. The third method, for flat work only, is to soften a thin veneer by wet steam,

and to force it into a hot die with sawdust and flour paste, with some suitable contrivance to allow steam to escape from the sawdust and paste. Imitations of very old carving have been very successfully made by branding the wood frequently with a red hot iron matrix. A mould in plaster of the desired shape is given to the iron moulder to reproduce in iron. The iron mould is heated, and pressed against the wood; at each heating and pressure, the charred wood is removed with a wire brush, and in this way the wood is gradually charred and burnt out instead of being cut out.

Artificial wood or sawdust ornaments are generally made of sawdust, glue, and flour paste kneaded into a dough and pressed into hot metallic dies.

USEFUL HINTS RELATING TO HOUSE BUILDING.

In building a house for myself, to cost about $5,000, what are the *special* points which I must watch—points which may be overlooked by the architect or contractor, because, perhaps, not properly in their province, or because the owner should himself know them? I have never yet built a house, and am, in consequence, wholly inexperienced—an easy prey to imposition and mistakes.

The writer having had some experience in building houses as an owner, and paid somewhat dearly for it, proposes in this article, and, perhaps, in others that may follow, to indicate some of the *points* desired.

In the first place, *be most careful in the choice of your lot.* Do not allow the cost per foot to be the most important element in your decision. A *low-priced lot* in the beginning may be the *dearest* in the end, that is, if it is chosen simply because it is low in price. Avail yourself as much as possible of the benefit of others' improvements. If there are desirable residences adjacent to the lot of your choice, the value of yours will be assured at the outset. Remember that you are about to put a certain sum of money into an improvement upon whatever lot you select, and that a *badly located* lot will *decrease* the value of this, while, on the contrary, a *good* lot will enhance the value. Many have suffered disappointment, and actual loss, by an error of judgment in this regard. Your choice will make the difference between a good asset and a poor one.

Having chosen well as to this point, see to it in the second place that the lot *can be easily drained.* To this end, it is not necessary that the ground should be *high*, but rather that it have a slope in *some* direction, otherwise, owing to the *soakage* into the ground of the surface water, which ought to *run* off, your cellar may be damp or even wet at times.

A dry cellar is of the utmost importance, and this is one of the ways to secure it. Another point to be considered in your choice should be *the exposure* it would give your house. By this we mean the way it should front. A wise decision here will conduce greatly to the comfort and health of your family. The writer's experience is that the best frontage or facing for a house is *a little west of south.* This more than any other opens up the rooms to the sun in the winter and to the southwesterly breezes in the summer, thus making the house warm, healthy, and cheerful in the former, and cool and delightful in the latter, as the prevailing winds during the summer are from the southwest. At the same time, they carry away *from* the house the odors and heat of the kitchen; and during the winter the living part of the house is protected from the cold northerly blast.

(*To be continued.*)

THE FARRAGUT CLUB HOUSE.

Our colored plate this month shows the architecturally attractive building of the Farragut Boat Club of Chicago. This club is, as its name indicates, an athletic organization, but, as may be presumed from the picture of its house, is devoted in no small measure to the amenities of social life. A home so extensive, and even elaborate, would not be required solely for athletic purposes; and still, having gained great prestige and reputation upon the water, this club never loses sight of its "chief object in life," but simply adds to its attractions club features which interest the members during the season when out door sports are out of the question. Organized nearly fifteen years ago, the growth of the club has been slow and legitimate, and the building of the present club house was for the purpose of supplying the actual necessities of the organization, and providing a house which would adequately accommodate the members and befit the honorable rank achieved by the club. The site selected for the house overlooks Lake Michigan from a point near 31st Street, and is in the midst of the best residence district of the city.

The plans were made by Robert Rae, of the firm of Rae & Wheelock, architects, who is also a member of the club. The intention was to provide a house which would combine all the essentials in the way of club rooms, and at the same time furnish an unusual area of balcony and observatory space for the use of members during the summer months, when aquatic sports are in progress on the lake. The site is so commanding that the entire harbor and lake front, and much of the city, can be viewed from the observatory or lantern of the club house. The ground dimensions are 90 by 40 feet, and the building rises to the height of three full stories, and is surmounted by a gabled roof and tower. Opening from the second story there is a loggia of ample dimensions to accommodate nearly one hundred persons, and the front is further broken and ornamented by two or three hooded balconies. The material used is brownstone and pressed brick, while the balcony gables are finished in bronze and slate. The roof is covered with red slate, with copings of galvanized iron. The main entrance is through an archway and loggia paved with Minton tiles, and opens into an entrance hall from which springs a grand stairway in antique oak. An elaborate mantel of the same material occupies one side of this handsome hall, the decorations of which are in Turkey red and bronze. The other apartments on this floor are the grand parlor, library, directors' parlor, card room, billiard room and coat room, all handsomely frescoed, elegantly furnished, and arranged *en suite*, so that they may all be thrown together for reception purposes, or used separately, as occasion may require. The architectural features of this interior include a semicircular niche or "cozy" in the library, an inset "bay" in the parlor, and the novel and elaborate treatment of the entrance hall and grand stairway. This stairway leads to the handsome ball room above. This room, with a twenty foot ceiling, a striking gallery, and a thoroughly equipped stage for amateur theatrical purposes, is frescoed in soft buff tints and bronze, and is one of the most attractive ball rooms in Chicago. Large doors give egress to the main loggia, which in warm weather is thus made pleasantly tributary to the ball room. On the same floor are the ladies' parlor, gymnasium, and superintendent's offices. The floor above is devoted to servants' rooms and to storage.

The spacious basement, eleven feet in the clear, is given up to bowling alleys, pool tables, dressing rooms, baths, steam heating apparatus and other conveniences. The boats of the club are accommodated in a separate house, immediately on the lake shore, and are not carried into the club house, although that building is within a stone's throw of the lake.

The cost of the club house with its furnishings was about $40,000, including the land on which it is built; but owing to the rapid appreciation in the value of the land, and also to the extremely low building contracts that were secured, the property could not now be replaced for anything like the low sum it cost. The present officers of the club, most of whom have been in charge of its business since the inception of this enterprise, are: Lyman B. Glover, President; G. R. Blodgett, Vice-President; Frank M. Staples, Treasurer; S. W. Jackson, Secretary; G. W. McClellan, Captain; W. R. Fowler, Commander; H. C. Avery, Lieutenant; G. B. Jennison, Ensign; and Harrison Kelley, Chairman of the Board of Admission. The membership is about three hundred.

DWELLING AT BABYLON, L. I.

A small house costing only $1,600 is the subject of portion of our colored plate in this issue. It is now in course of erection on ground situated in the town of Babylon, Long Island, New York, the architect being William H. Beers, of the Tribune Building, New York city.

The elevation is of attractive appearance, calculated to prepossess any one in its favor, while the plan, with the somewhat original feature of a room on the upper story, is conducive to comfort and economy of space.

The materials employed in the construction of the building are fully described in the following specifications:

SPECIFICATION

of materials and labor required in the erection and completion of a dwelling house to be built on ground situated in the town of Babylon, Long Island, N. Y., according to plans and specifications, and under the superintendence, of William H. Beers, architect, Tribune Building, New York city.

Drawings, etc.—The contractors will make no alterations from drawings or specifications, but should any error or inconsistency appear in these during the progress of the work, it shall be the duty of the contractors to duly notify the architect, who will make the proper adjustments.

The drawings and specifications are to be used for this building only, and are the property of the architect, and are to be carefully treated and returned to him on completion of the work. The drawings and specifications are to be signed by both owner and contractor, for the purpose of identification.

General Requirements.—The contractor is to furnish all transportation, labor, materials, scaffolding, etc., for performing the work in the best manner. All materials shall be the best of their several kinds, and all work done in a thorough and workmanlike manner, to the true intent and meaning of the following specifications and accompanying drawings, which are intended to include everything requisite and necessary to the proper and entire finishing of the work, notwithstanding every item necessarily involved by the works is not particularly mentioned. All work, when finished, to be delivered up in a perfect and undamaged state.

Any portion of the work done by the contractors of a quality not approved by the architect shall be forthwith removed by and at the expense of the contractor, and replaced by him in a proper and satisfactory manner.

The contractors must do all the necessary cutting and patching, and make good after all mechanics, also clean out building when required by the architect, also cart away all rubbish that may accumulate at any time during the progress of the work and is not required on the premises, but he can put the same in any suitable place, if any such place can be found on the premises.

All masonry as laid to be properly protected from the weather by the mason, and the carpenter must provide suitable protection to all openings to keep out the cold, rain, etc. The carpenter will provide set centers, etc., required by the mason.

Excavations.—Make excavation for cellar the full size of house, as shown on cellar plan, to about the depth of four feet below the line of the present grade, and place the earth in a convenient place for grading.

Grading.—Fill in around and pack the earth against the cellar walls, after the mortar is dry, and grade the excavated earth around to the height of about one foot six inches above the line of old grade, and slope off the ground on all sides of the building as directed.

Footings and Concreting.—Make footings for all walls, piers, posts, chimneys, etc., of concrete, composed of coarse gravel, one part cement and two parts lime, and sharp sand, also concrete the cellar bottom to the depth of four inches, with the upper surface left straight and level.

Brickwork.—Build cellar walls, piers, chimneys, etc., to the heights and thickness as shown on drawings, of good, hard burned brick laid in mortar composed of one part cement, two parts lime, and the necessary quantity of clean, sharp sand, laid true and plumb with flush joints. Build flues in chimney stacks as shown on drawings. Leave all flues clean and smooth, and plaster all chimney stacks on all sides, as they are laid up to the under side of roof. Also build all other brickwork as shown on plans.

LATHING AND PLASTERING.

Lathing.—Lath all walls, partitions, ceilings in first and second stories and ceiling in kitchen with sound lath of full thickness, laid on ¾ of an inch apart and thoroughly nailed, joints broken every eighteen inches. Under no circumstances must lath stop and form a long, straight, vertical joint, nor any lath put on vertically to finish out to corners or angles; nor must there be any lath run through angles and behind studding from one room to another; all to be formed and nailed solid in angles before lathing; should there not be any properly secured, stop and notify carpenter.

Plastering.—All walls, partitions, and ceilings in first and second stories to be finished with best two coat work, to be properly put on, and applied with sufficient force to secure strong clinches; level and float up the brown coat, and make it true at all points. Cover all the brown mortar with a good coat of best white hard finish, composed of finishing lime-putty and plaster of Paris and clean washed white sand; mix in proper proportions, so as to secure a good and workmanlike job; all lathing and plastering to extend clear down to the floor, and all walls to be straight and plumb, and all angles to be sharp and regular; do all the necessary patching after other workmen, and leave everything in a perfect and complete state.

CARPENTER'S WORK.

Timber.—The timber used throughout this building to be of good quality, well seasoned, and free from sap, shakes, large or loose knots or other imperfections impairing its durability and strength. All to be of spruce excepting where otherwise mentioned.

Framing.—Size of timbers: girders in cellar, 6 in. x 9 in. of spruce timber; sills, 4 in. x 8 in., halved and spiked at angles; posts, 4 in. x 8 in.; girts, 4 in x 6 in.; plates, 4 in. x 6 in.; braces, 4 in. x 4 in.; floor beams, 2 in. x 9 in., placed 16 inches centers; roof rafters, 2 in. x 7 in., placed 20 inches centers; collar beams, 2 in. x 7 in.; studs for filling in outside walls, 2 in x 4 in., of hemlock; partition studs for inside partition, 3 in. x 4 in. and 2 in. x 4 in., as shown, of hemlock; hip and valley rafters, 3 in. x 7 in.; ridge, 2 in. x 9 in.; trimmers and headers, 4 in. x 9 in. Veranda timbers: sills, 4 in. x 6 in.; plate, 3 in. x 4 in.; floor joists, 3 in. x 6 in.; rafters, 3 in. x 6 in., placed over each post and chamfered; purlins, 3 in x 4 in., about 2 ft. 6 in. from centers and chamfered; posts 6 in. square and turned as shown, of white pine; all trimming to veranda to be of white pine.

The frame to be thoroughly braced at angles, posts to be mortised into sill, girts well framed into posts and beams notched on to sill and girts, etc., and all framing to be done in a substantial manner and to the satisfaction of the architect.

Cross Bridging.—Bridge each tier of beams with two rows of cross bridging to each tier except attic, which will have one row, with 1 in. x 2 in. stuff.

Headers and Trimmers.—All headers and trimmers to be 4 in. x 9 in. properly framed together, leaving all openings of sufficient size for the finish of stairs, chimneys, etc., and in no case allow the wood to come within 1½ inches around chimneys; care must be taken in framing, so that important timbers will not require cutting for chimneys, heater pipes, plumbing, etc. Cross furring for first story ceiling of 1 in. x 2 in. stuff.

Exterior Work.

Sheathing.—Cover the whole frame and roof with square-edged hemlock sheathing, free from large loose knots, laid with close joints and thoroughly nailed to frame.

Building Paper.—Cover the sheathing of all outside walls and roofs with best sheathing paper, carefully tacked on and lapped three inches, and neatly fitted around all openings, dormers, gables, etc., in roof. Rosin-sized sheathing paper to be used.

Clapboarding.—Put on best quality of clear, dry white pine clapboards, all laid perfectly even gauge of not over 4 inches; cut close joints against all casings, etc., and all well nailed to every stud, with nails set in for puttying.

Corner Boards.—Casings, bands, etc., to be of the width as shown on drawings and about 1¼ in. thick, and all other trimmings to be as shown on drawings. All this work to be of well seasoned white pine free from large loose knots, etc.

Veranda.—All posts to be turned as shown, rail and brackets, cornice, etc., as shown. The veranda roof to be laid with narrow tongue and grooved stuff beaded on one side, laid close and well nailed. All to be of white pine.

Lay the floor with tongue and grooved white pine flooring about 4½ in. wide, blind nailed and laid close. Construct steps as shown, 1¼ in. tread, ⅞ in. rise, to have cove under nosings, etc. Case under veranda floor down to grade level with latticework as shown.

Shingles.—Where shown on elevations, shingle outside walls with good quality of 16 in. sawed white pine shingles, laid to the weather about 5½ in. and applied in the best manner, as shown; cut the butts of shingles octagonal for the second story, as shown on side walls.

Roofing.—Carpenter shall frame and construct according to drawings and sections, etc., all roofs in the most thorough manner, all thoroughly spiked and braced. Do all the necessary framing as required for gables, chimneys, etc., provide and fix the ends of rafters of size as shown, and cut to the forms shown, all to be well nailed to main rafters. Also provide and put in place, as shown on section, a gutter with moulded face, well nailed and supported, of white pine, and pitch the water to points indicated for leaders.

Make all the moulded cornices on gables, etc., as per details furnished, and all other work in gables, etc., as shown on elevations. Make cresting, etc., as shown out of 1¼ in. stuff, and furnish all turned finials as shown.

Shingles to be put on in the best manner, properly laid, joints broken, each shingle to be well nailed, and to stand away from angle of valleys 1½ in. These shingles to be of best quality white pine and laid about 4½ in. to the weather.

Windows and window frames to be as shown on drawings, made in the ordinary manner, with boxes for sash weights, to be of well seasoned white pine, weather lapped meeting rail, and to be double hung with the best hemp sash cord and cast iron weights. Cellar windows and w indows in gables, as shown, to swing and made water tight.

Glass.—All the windows in first and second stories to be glazed as shown, with clear, double thick, American sheet glass. The glass for sashes in roof and cellar to be glazed with single thick sheet glass. Provide and hang to all windows on first and second stories, outside blinds, in two folds with rolling slats, hung with hinges and secured with proper fastenings, primed before coming to the building. Do all other outside woodwork shown on drawings, but not particularly mentioned.

Interior Work.

Flooring.—Lay all flooring in first and second stories with white pine flooring, tongued and grooved, not over 5 in. wide and well nailed to beams and free from large or loose knots, shakes, or other bad imperfections. All flooring to be tongued and grooved, and laid close to the outside wall, closing up all spaces completely. All joints to be leveled off smooth.

Base Boards.—There will be a 9 in. base board on first and upper floors, with moulded top.

Doors and Architraves.—All doors and window openings to have a 4 in. architrave, with turned corner block and base block high enough to receive the full base, all to be thoroughly nailed and put up in the best manner. For inside of closets a plain casing to be used. All windows on first and second stories will be finished down to sill with apron piece.

Doors.—There will be a glazed front door, as shown on elevation, 1½ in. thick. All doors on first and second story and attic shall be four panel flush moulded, 1½ in. thick, and of the sizes marked on plans. Closet door to be 1¼ in. thick and moulded on one side.

Closets.—All closets on second story one row of shelves and the necessary number of closet hooks.

Portable Coal Slides.—Construct a portable coal slide to fit cellar window, of ⅞ in. plank, and made so that they can be taken out and in with ease.

Coal Bins, etc.—Construct bins in cellar with hemlock boards as usual.

Main Staircase.—To have 1 in. riser, 1¼ in. tread, tongued and grooved together. Treads to have nosing with cove under, finished work of stairs to be put up after plastering is finished and dry; wall strings to be 1½ in., top edge moulded to correspond with adjoining base. All to be of best white pine.

Newels, Rails, and Balusters.—To be as shown on section, and details to be of selected dry white ash, all to be properly secured. Main newel turned, small newels turned, balusters turned as shown on section and details.

Privy.—Build a privy 5 x 7 feet where directed, with seat, covers, etc., to be of the usual height inside, roof hipped and shingled, window inside about 20 inches square, swinging sash, and glazed with single thick glass, paneled door, with butts, lock and bolt, exterior walls shingled, eaves moulded.

Tinning.—Use the best I. C. charcoal tin for all hips, ridges, valleys, gutters, dormers, etc., the side of each sheet painted one coat before laying, and all valleys, hips, gutters, etc., painted three coats before the shingles are put on.

Gutters.—Line the gutter of main roof, and run the tin up under the shingles at least 10 inches; bring the tin over the face of cornice and tack it down and well soldered. Do all necessary tin flashings and top of window caps, etc., and do all other necessary flashing; go over the work, and stop all leaks after other craftsmen, and leave everything tight.

Leaders.—Put up and properly connect with gutter a 4 inch tin leader in front of house from main roof, with the necessary curves, bends, breaks, etc., to convey the water from the gutter. Have suitable shoes at bottom, to throw the water away from the building.

HARDWARE.

Locks.—The main entrance and vestibule doors to have mortise locks with keys, said doors to have imitation bronze fronts, butts, and knobs. All other doors on first and second stories to have mortise locks with white porcelain trimmings and iron loose joint butts. All outside bed-room doors to have mortise bolts on second story. Rim locks to all closet doors. Furnish all the necessary locks, keys, butts, drawer-pulls, etc., of imitation bronze.

Sash Locks, etc.—Furnish to all outside windows on first and second stories improved sash locks of imitation bronze.

Sash Pulleys, Weights, and Sash Line.—To all windows suitable size sash pulleys, best hemp line and weights, etc. Furnish all hinges and fastenings for outside blinds.

Closet Hooks, etc.—Furnish all necessary closet hooks, black japanned.

Furnish all other hardware necessary to make this building complete, of a quality as above specified and carefully put on, so that all doors will lock and be in good order when left.

PAINTING.

Furnish all material and perform all labor for the full completion of all the woodwork. All lead and oil must be of the Atlantic White Lead Co.'s make. All woodwork must be thoroughly cleaned off, sandpapered, cracks and nail holes stopped with putty, knots properly killed, and woodwork free from dirt and dust.

First Story.—All woodwork on first floor to be painted three coats of such colors as directed by the architect.

Second Story.—All woodwork in second story to have three coats in two colors, as directed by the architect.

Newels, Balusters, and Rail to main staircase to be filled with patent wood filler properly applied, rubbed down, and cleaned off, and finished with two coats of hard oil finish.

Outside Work.—Paint all outside woodwork included in this specification, including all roofs, etc., three coats of best white lead and linseed oil paint of such colors as the architect may direct, and all work both inside and out must be to his entire satisfaction. All paint and varnish spots to be cleaned off of walls and floors at completion of the work, and all left in a perfect state.

PLUMBING.

Furnish all materials and perform all labor requisite and necessary for putting up and completing all the plumbing work in a thoroughly workmanlike manner, according to drawings and specifications.

All water pipes must be so put in that they can be readily got at at any time for examination. All lead pipes to be secured with hard metal tacks and screws, and all lead waste connections to iron pipes to be made through brass ferrules. Iron waste pipe to have joints calked with oakum and run with molten lead.

Sink.—Furnish and put up a galvanized iron sink, where shown in kitchen, with cold water supply and brass cocks, and waste through a 2 inch lead pipe with trap and trap screw, and connected with 2 inch iron waste pipe running to cellar. Make all the proper cold water connections.

Pump and Supply Pipe.—Set in kitchen, alongside of sink, a double-acting pump, and make all the necessary connections with 1 inch galvanized iron pipe from well.

$2,600 SUBURBAN COTTAGE.

CHAS. E. HEBBERD, ARCHITECT, 62 BROAD ST., N. Y.

This illustration represents one of five detached cottages erected at East New York. The contract for entire work, including painting and plumbing, was given out at $2,600 each. The building has a frontage of 21 ft. by 30 ft. 6 in. deep, and a one story extension 10 ft. x 18 ft. Height of first story, 10 ft.; second story, 9 ft. 6 in. Attic left unfinished, but with sufficient height and light to admit of finishing two good sized rooms if wanted. Cellar under entire building, 6 ft. 6 in. high. Foundations above ground of brick laid in red mortar; all cellar openings furnished with bluestone sills, outside cellar steps and coping of bluestone, chimneys furnished with bluestone cap with flue openings cut out.

Lathing, plastering throughout in two coats, and hard finished cornice in parlor, dining room, halls, and front bed room. Timber of frame of spruce. Frame covered with mill-worked sheathing, put on diagonally, this covered with heavy rosin sized sheathing paper, and then inclosed with 6 in. clear beveled clapboards. Shingles with ornamental ends placed where shown. Posts of porch and railing turned. Floors throughout of white pine, 5 inches wide. Inside finish of white pine with moulded pilaster, finish with corner and base blocks.

Doors throughout paneled; 1½ inch room doors, 1¼ inch closet doors. Windows glazed with double thick French sheet glass, with marginal lights of cathedral glass in upper sashes; outside blinds throughout.

Kitchen provided with sink and wash trays. Chair rail on walls of dining room. Picture mouldings throughout. Slate mantels in parlor and dining room.

Tin Roofing Plates.

If the foundation of a building is paramount in construction, as doubtless it is, the roof which is to protect the whole edifice is only second in importance. The qualities of tin as a roofing material rank high, as may be amply proved by the great popularity it has attained during the past few years. Convenient in application, durable, and very economical, it has gained in favor and is now employed to a far greater extent than any other material throughout the country.

Of late, tin roofing has been severely attacked on all sides. With the competition of these days and the consequent reduction in the price of roofing of this description, much of the material has been of far inferior quality to that produced in former years. With the lowering of price, we get a corresponding reduction in the quality of the material, so that at the present time the market is stocked with tin plates, many of them of so inferior a quality as to be wholly unfit for their purpose.

Under these circumstances, it is a pleasure to refer to the plates of Messrs. Merchant & Co., of No. 525 Arch Street, Philadelphia, who have also offices at New York and Chicago. This well-known house issue the first quality of plates in the market, under the name of "The Gilbertson Old Method." They are of far greater weight than usual, averaging 120 pounds for each box of I. C. 14 × 20, and have an extra thick coat of uniformity and quality. To prevent fraud and guarantee that the purchaser shall get what he is paying for, each sheet is stamped with the name and thickness of the metal, and thus the owner and architect have insured the proper performance of the contract by the builder, in this important respect at least.

We have not space here to show the material gain from a pecuniary point of view, effected by the use of a good quality of roofing, but that it is the truest economy in the end there can be no doubt.

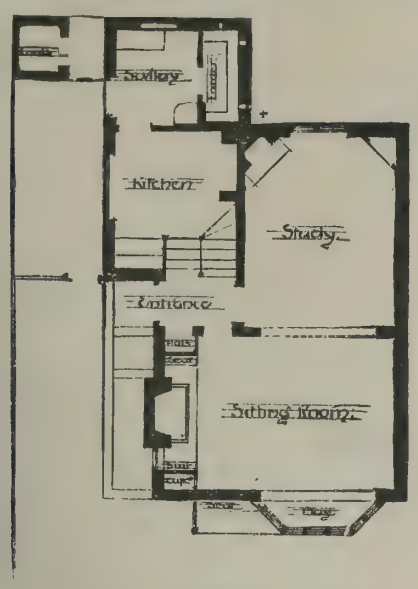
The house of Merchant & Co. has long been identified with the best quality of tin plates, and no better proof could be had of the justice of this than the fact that their goods were chosen, after undergoing the most thorough and severe tests, for the White House at Washington, and this at a price higher than that of their competitors.

We have had enough of bad roofs and more than sufficient of the grumbling of builders, owners, and architects at the poor quality of tin plates. Let them use the goods of Messrs. Merchant & Co., and see that they are properly laid, and there will be no further cause for either the one or the other.

THE Richmond Weather Strip Co., Richmond, Ind., report an unusually good trade for 1886. They have sold over 20,000 of their strips for bottoms of doors, and 200,000 feet of Excelsior rubber stripping for sides of doors and for windows.

AN ENGLISH COTTAGE.

We give from the *Architect* an elevation of "Thought Cot," an English cottage for Mr. W. Norman Marshall, Brentwood, Eng. The building is to occupy a limited piece of ground. We give a small plan of lower floor. The others will be readily understood. The architects, Messrs. H. & E. Marten, have endeavored to utilize to the best advantave a limited frontage. One spacious room is obtained on the ground floor capable of division by sliding partition; also small kitchen, scullery, and



PLAN OF LOWER FLOOR.

larder. Five bed-rooms are obtained on mezzanine, first, and second floors, together with bath-room, water-closet, and box-room. A hall with fireplace, and an additional sitting-room over, are now in course of erection. The materials used are red bricks. The roofs are covered with red tiles, which contrast pleasantly with rather more than the usual amount of white paint. The spaces between framing in gables are filled in with dark rough cast in cement.

Drilling Holes in Plate Glass.

The last volume of the "Transactions of the American Society of Mechanical Engineers," recently issued, contains a discussion on the best method of drilling holes in plate glass, which contains some points of interest to our readers. Mr. Durfee mentioned his successful experience in drilling holes three-sixteenths of an inch in diameter through glass plates about one-eighth of an inch thick, by the use of an ordinary bow drill, with spirits of turpentine as lubricant. The holes were drilled from one side until the drill just punctured the opposite side of the glass; then the glass was turned over and the holes finished by drilling from the opposite side.

Mr. Oberlin Smith recorded fair success with a very hard drill and the same lubricant in drilling holes one-half inch in diameter in plates one-quarter of an inch thick; but instead of turning over the glass, he put a piece of perfectly flat cast iron under the glass, with a little piece of paper between, clamping all firmly together, and permitted the drill to puncture the iron a little.

Mr. Ashworth referred to the remarkable efficacy of the sand blast steam jet in drilling holes through glass, and Mr. Towne stated that that was, undoubtedly, the best method where the work is to be done in large quantities and can be sent out to be done. But for doing the work in small quantities in one's own establishment, he instanced the method employed in the works of the Yale & Towne Manufacturing Company for drilling holes seven-sixteenths of an inch in diameter through glass one-eighth of an inch thick. The best tool for the work was found to be a brass tube five one-hundredths of an inch thick, the cutting agent being emery, No. 5 H, and the lubricant simply water, which they had found as efficient as oil or turpentine, and much less troublesome.

Thus the workman was able to drill thirty to forty holes per hour, the drill being run at 2,000 revolutions per minute, and the drilling of forty holes through the one-eighth inch glass using up about one inch of the tube. Mr. Towne added that it was important to keep the emery well washed and cleaned, that is, with the dust removed from it which results from the abrasion of the glass.

For small holes, Mr. Stetson could conceive of nothing better than the diamond drill.

Drain Pipe Traps.

In the convention of the American Institute of Architects, held in New York city, Dec. 1, 2, and 3, a report was presented by Mr. Glenn Brown, architect, Washington, D. C., on the subject of experiments in "Trap Siphonage."

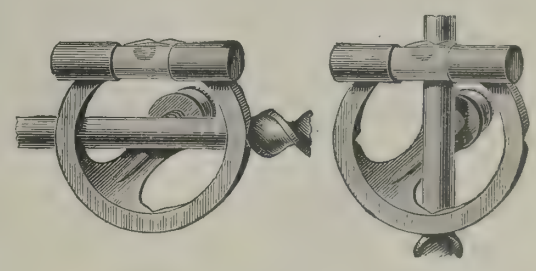
The investigations relating to this subject were carried out at the Museum of Hygiene of the Navy Department, at Washington, D. C.

The experiments have been conducted with the view of obtaining simply facts, without the ulterior object of introducing some patented article, where commercial interests are concerned. There were tests made of existing systems of trap ventilation, and patented traps that claim to need no ventilation. In testing the different forms and manufactures, the fixtures were subjected to a strain equal to what they would receive in actual use, and also strains more severe than ordinary uses, and intended to cover unusual demands. To quote from the report: "The majority of the experiments have been made to test the power of the traps to resist siphonage and back pressure produced by the column of water passing down the vertical pipes. The question of first importance is: *Does ventilation protect the seal of traps in ordinary use?*" Ninety-nine tests of vent pipes and traps are recorded in the report, "in all of which the vent pipes were open and a positive effort was made to break the seal of the traps," except in "the first experiment, when the fresh air inlet at the foot of the soil pipe, and the opening at the roof, were closed, in this way subjecting the traps to the greatest strain which they could possibly have to resist, for either siphonage or back pressure." The deductions arrived at, according to tests, are as follows:

1. The seals of ventilated traps are safe against siphonage and back pressure.
2. The seals of unventilated traps are never safe from siphon action or back pressure, except in deduction four.
3. The vertical vent should be three inches, with a four inch soil pipe.
4. Traps connected on a horizontal pipe and fixtures discharging on the same level into horizontal pipe apparently have no effect on unventilated traps.
5. All varieties of non-mechanical traps are more easily affected by back pressure than by siphonage.
6. The ball traps were not affected by back pressure, but by siphonage.
7. The Sanitas trap withstood siphon action better than any of the patent traps, but was easily affected by back pressure.
8. The sewer air is more liable to enter unawares by back pressure through the seal of the trap, because the seal remains unbroken.
9. Difference in friction of iron and lead pipes made no apparent difference in the effect on the traps.

BIT AND SQUARE LEVEL.

The very trite saying, "*Necessity is the mother of invention,*" is verified again in the birth of the little article illustrated in this column. Every mechanic



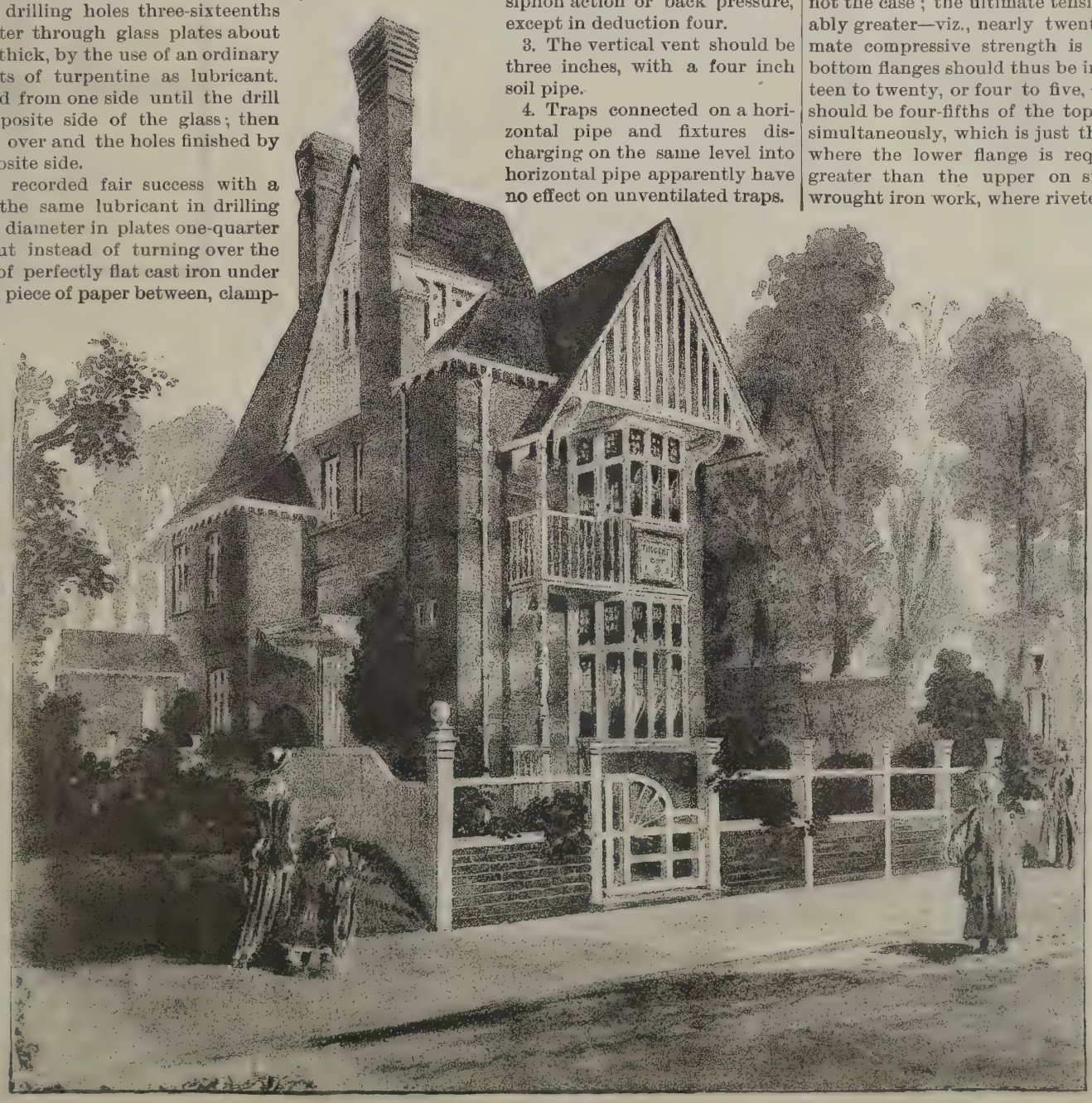
BIT AND SQUARE LEVEL.

realizes the necessity of boring with precision; but the methods for doing so have not been easy, or always reliable.

The article shown here is made of brass, and has three pairs of V slots, in either of which the shank of a bit will lie; and when secured by the thumbscrew, accurate boring can be done vertically, horizontally, or at an angle of 45°. Another use of this ingenious device can be made by attaching it to one leg of a framing square, thus forming a substitute for a spirit level, while the other leg of the square will indicate an exact plumb line. The Stanley Rule and Level Co., New Britain, Conn., are the manufacturers, and hardware dealers keep them for sale.

Top and Bottom Flanges of Wrought Iron Beams.

It is obvious that if twelve tons per square inch were the ultimate tensile strength of wrought iron, such beams should have the same quantity of material in both their upper and lower flanges. This is, however, not the case; the ultimate tensile strength is considerably greater—viz., nearly twenty tons—while the ultimate compressive strength is sixteen. The top and bottom flanges should thus be in the proportion of sixteen to twenty, or four to five, *i. e.*, the bottom flange should be four-fifths of the top flange for both to fall simultaneously, which is just the reverse of cast iron, where the lower flange is required to be six times greater than the upper on similar grounds. With wrought iron work, where riveted plates are used, the bottom alone is weakened by the rivets passing through the plates, the top remaining uninjured as regards compression, and on this account (neglecting the rivets in the calculation) little difference is practically made in the area of the top and bottom flanges of such girders.—*Edwin Clark, in the Architect.*



THOUGHT COT, BRENTWOOD, ENGLAND.—H. & E. MARTEN, ARCHITECTS.

AN incidence window for lighting basements, vaults, etc., has been patented by Mr. Isidor Schoenberg, of Baltimore, Md. It is composed of a frame with a parallel series of glass blocks of right-angled triangular shape, with their long sides in the plane of the frame, the blocks projecting upwardly to expose their two sides, so as to give the greatest amount of exposed reflecting surface without shoulders, while the faces of the prism are readily accessible for cleaning.

DESIGN FOR A $2,000 COTTAGE FOR GEO. GABLE, ESQ.

EDWARD KENT, ARCHITECT, BUFFALO, N. Y.

This house is situated in Lancaster, Erie County, N. Y., and was built complete for the above cost. The original contract price was $1,900, but additional plumbing put in by owner brought the price up to $2,000. —*Building.*

DESIGN FOR A $2,000 COTTAGE FOR GEO. GABLE.—ED. KENT, ARCH., BUFFALO, N. Y.

The Architectural League.

SOME NOTES AND COMMENTS ON ITS SECOND ANNUAL EXHIBITION.

BY OUR SPECIAL CORRESPONDENT.

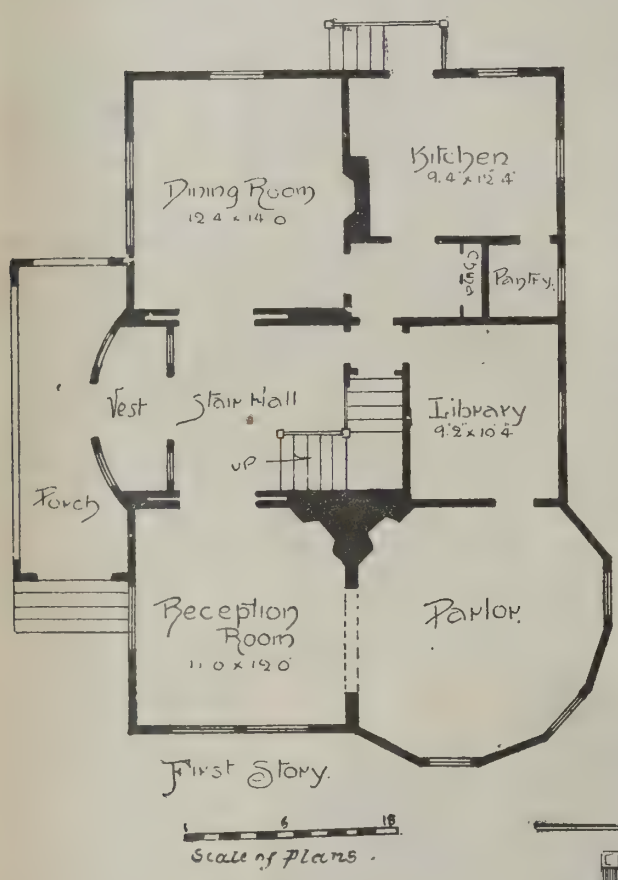
The League is an association of gentlemen who are interested individually and collectively in architecture as an art. Its membership comprises architects, artists, sculptors, painters, engravers, decorators, draughtsmen, and a few art amateurs. Its purpose is for mutual improvement in the technical and æsthetic arts, and it has faith to believe that so long as its membership is confined to persons who have some appreciation for art, it will continue to be successful. Its second annual exhibition was held this year at the American Art Galleries, in conjunction with the Salmagundi Club and the American Black and White Societies. The exhibition was opened on Monday, the 10th of January, and closed Wednesday evening, January 26th. The daily press of the city, in their meager and uninteresting notices, spoke of it in laudatory terms, and concurred in the desirability of such an undertaking. At its first exhibition the drawings were of too technical a character to obtain the attention they were entitled to, and some dissatisfaction was expressed at the result; but this year it was quite evident that better work had been done by the jury in its selection, although the efforts of its hanging committee were far from successful. The one hundred and eighty-nine drawings exhibited almost as great a variety in subject, style, and execution as the quarters of the world from which they came. While the subjects chosen to represent the League were excellent and interesting of themselves, almost every one, it must be confessed that the juxtaposition of detail sketches from Fontainebleau with Canadian court houses, Nantucket sketches, and cemetery gateway competitions looked rather kaleidoscopic. The suddden jump, for instance, from a New York printing house to a noted French cathedral, and from there to a chapel in Brooklyn, and back again to Europe, without any bridge, to Durham Castle and Cathedral, was, to say the least, rather astonishing. If variety was the Ultima Thule, it was certainly attained. If any connection could have been established by such an allowable architectural feature as a transition of style of some building in America from some building in Europe, the studied contrast would have succeeded in distinguishing the contiguous drawings or designs. If the various sketches from France, such as the Manoir de la Houblonniere, the sketch of Rouen, the very interesting bits of detail from Fontainebleau, the Amiens Cathedral, the quaint sketches in Normandy, the church tower of Darnetal, the Paris street scenes, the Roman monuments at St. Remy, and other sketches from France, had been placed in a group, they would have furnished ample variety and at the same time a sequence of contrast that would have heightened the interest in all of them. The same remarks will apply to the remarkably interesting but widely distributed sketches from Italy. There were enough to have made an effective group from Rome itself. The colored scraps of decoration from the Vatican were rendered in the highest style of artistic color work, and they alone were worthy of an hour's study of anybody's time.

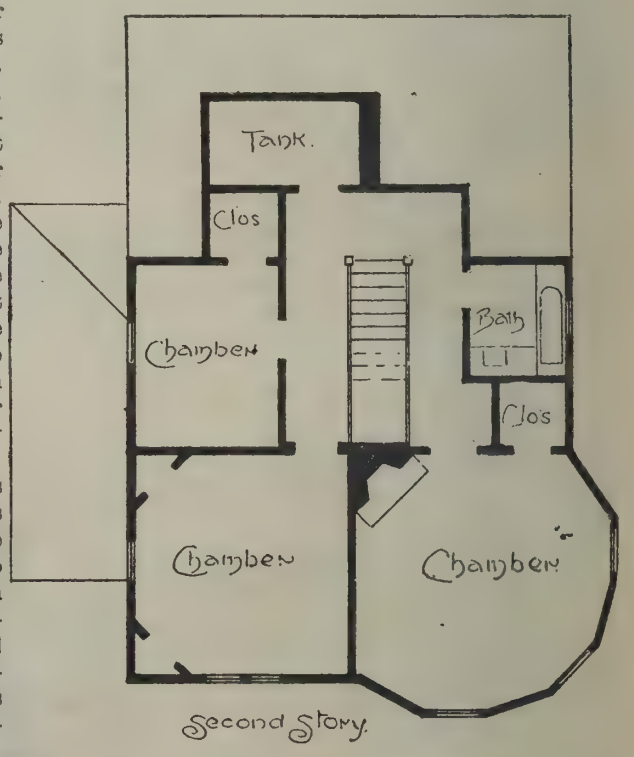
The favorite Venice was well represented, such as the Palazzo Greco, the Grand Canal, St. Mark's Square, and others. Carrying out the thought of some inter-relation, it would have made an effective group to have placed the various designs of school buildings in such proximity as to have invited a comparative examination. The advantages of such an arrangement will be apparent at the mere mention of the designs submitted, viz.: The American School of Classical Studies in Athens, the State Normal School and the Lawrenceville School, both of Massachusetts, and a school and chapel of Chicago, Illinois.

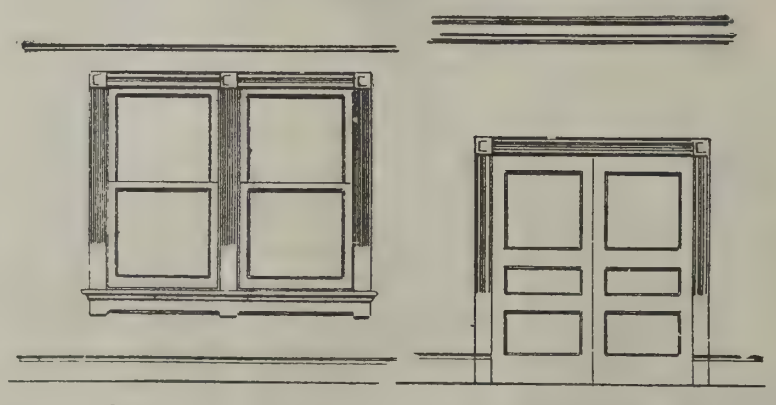
A great many designs of churches were exhibited, but they were so scattered among the foreign sketches and country houses that no one could have brought away an intelligent conception of their number and character. If other buildings of a class, such as club houses, country residences, city warehouses, and others, had been arranged so as to have been studied by comparison and grouping, the profession itself would have been as greatly benefited as its clients. The fertility of resource and ingenuity of conception displayed by these drawings were so great as to avert all danger of monotony or commonplace by the ordinary methods of grouping. The writer is enough of a Philistine to believe that if an exhibition of drawings, paintings, or statuary is gotten up with the purpose of making a showy effect, without attempting to be instructive in any particular, the spectacle ought to be treated as a show, and not as an exhibition hallowed by the name of art.

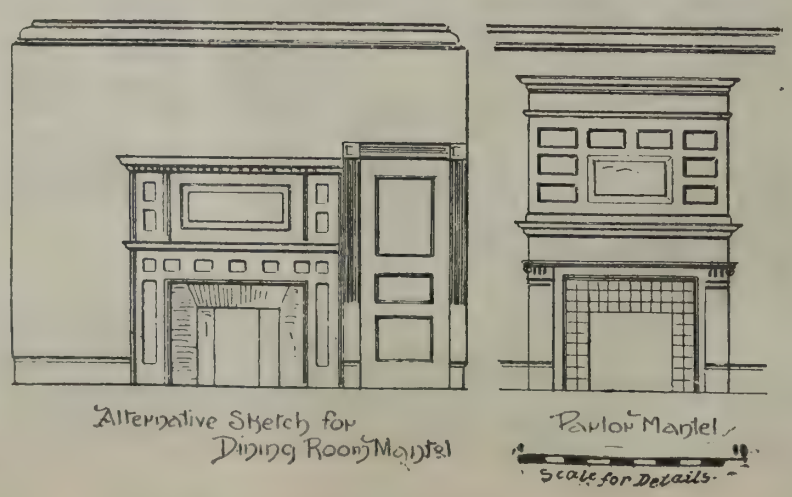
Some of the most interesting drawings were groups of what were styled alternative studies of country houses. The transitions were readily discernible and pleasing, and the differences sufficiently accentuated, but they would have been more attractive and comprehensive if the architect had furnished drawings of his plans of the interiors that originally accompanied them.

Many of the drawings shown were the originals of illustrations which have appeared from time to time in this and other architectural journals. We looked in vain for any signs of the architectural future; but as this was only the second exhibition of the League, perhaps it was unfair to have looked, but certain tendencies were discovered, and may be pointed out. As an instance of adaptation to the local needs, we noticed the study of a design for a city house, in which a Philadelphia architect had planned a corner house so that its principal rooms were lighted as well as a London drawing-room. It needs no prophet to predict a phenomenal success for the architect who can build a house on a twenty-five foot city lot, in which every room is abundantly lighted. The subject of light led to the discovery of the large number of plans which contained designs of square-headed Tudor-Gothic windows, the upper bars so high up as to make of the topmost sections a set of transoms, grouped together as in the modern English style. While this may look decidedly like a tendency toward such window construction, it might have been









only a series of coincidences, and if it was the former, it is worthy of being recorded.

The general symmetry of the roof lines was quite noticeable, and must be ascribed to a studied effort on the part of our architects to make them so. Taking each design separately, without any reference to the counter-effect of its neighbor upon itself, it gave every true lover of art progress a pleasure to note the symmetrical arrangement of contrasts, not a mere vulgar, wearisome balance of parts, but a recognition of the wider inter-relationships of constructive and decorative features, and in this very recognition we hail the promise of a bright future.

As the late Mr. Ferguson has rightly said, the present unsettled state of architecture is a misfortune to the art. The causes lie deeper than architects can control; they cannot change the spirit of an age, but they can adapt themselves to its greatest needs, and in many ways can indicate by their works what ought to be done.

One of the best means of crystallizing and educating architectural taste is the annual exhibition of designs of current work; and if the best good of the profession is desired, rather than an opportunity for a display of personal vanity, these exhibitions must be conducted upon such a wide and liberal basis as to afford an instructive lesson rather than a passing spectacle to those who take the trouble to attend them. It is our people as a people who need cultivation in the arts, and not the architect, who has spent the most precious years of his youth and his life in acquiring that broad and fundamental culture which the world willingly acknowledges belongs to him because of his profession. Where so much that has been done has been well done, it is rather trying to have to say it might have been done better; but the tendency to exhibit perspective sketches without the keys to them, viz., the plans, elevations, and sections in detail, is a reprehensible one, and should not be countenanced by the League.

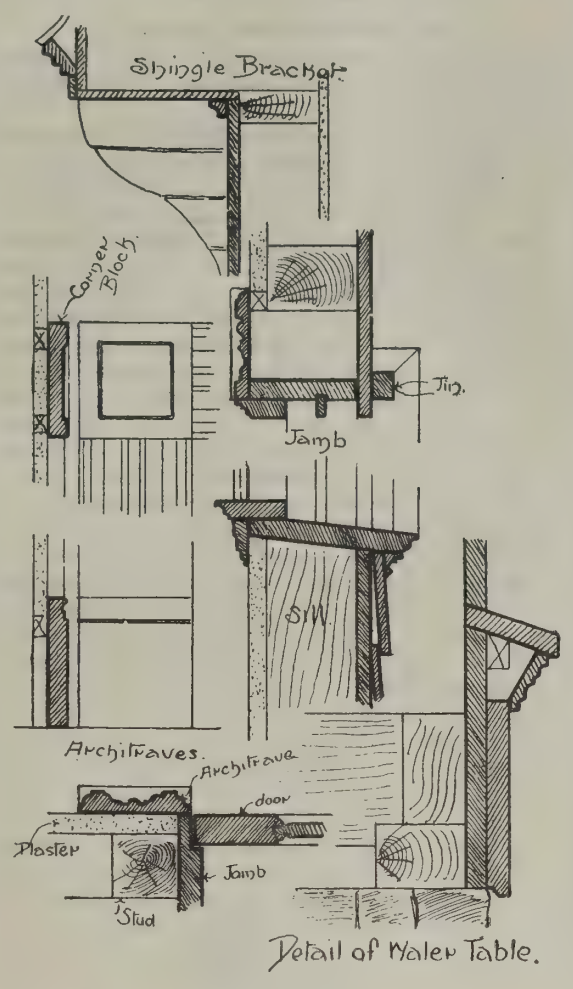
There can be no doubt that every architect desires to see the art of building elevated to a fine art, and to reach that stage it must possess proportion and expression. It may be that some of us who visited the exhibition are deficient naturally in the power of perceiving beauty, or that we lack the truest refinement in form, color, or modulation of light and shadow; but if we have any such perception, be it never so little, it can be cultivated by being appealed to, and until it is brought to some visible state of culture, architects and the people at large may look in vain for the dawn of an American style of architecture.

Notwithstanding our restrictions upon the manner in which so much good material was displayed, it remains for us to say, and with pleasure, that the widespread interest manifested in their work ought to endue the League with new vigor, inspire them with noble purposes, and urge them on enthusiastically to higher and better work.

TURTLE shells may be softened by hot water, and if compressed in this state by screws in iron or brass moulds, may be bent into any shape, the moulds being then plunged into cold water.

An American Coaster.

The loftiest spars at the South Street piers below Wall Street recently were the three masts of the new schooner William W. Converse, fresh from Hanscom's yard at New Haven, where she was launched on Dec. 15. An examination of the Converse shows the wonderful progress made in the construction of coasting vessels in the last few years. Although under the present rules of measurement the Converse registers 708 tons, she will carry 1,200 tons of cargo, quite as much as the square-rigged ships of a few years ago and fully as much as the average bark of the present time. She does this on a draught of 15½ feet of water, and she needs a crew of only nine men, all told, or about one-half the number carried by a bark. She is 180 feet long on deck, 37 feet 8 inches wide, and 18 feet deep. She was modeled by Warren Nettleton, and her owners, among whom is William Converse, president of the Winchester Arms Company, assert that she will not only outcarry, but outsail, the coasting fleet every day in the week. An examination of her lines and a look at the amount of cargo she carries show that there is some foundation for the confidence of her owners. Besides this, she is as handy as a yacht, and for that matter, quite as handsome.



The dimensions of a vessel of this kind are not uninteresting. Her spars are from 91 to 93 feet long. Her topmasts 56 feet. Her spanker boom is 70 feet long, and her jibboom 60. The fore and main booms are 48 feet, and all gaffs 46. It required 5,000 yards of canvas to clothe her. Her frames are white oak and chestnut, and she is ceiled and planked with yellow pine. As a sample of her strength, it may be said that from the bottom of her keel to the top of her keelson the logs are piled up eight feet high. It took ten tons of bolts to hold them together. She is the second vessel fitted with the patent tubular steering wheel, which is a model of strength and beauty.

The Converse is noticeable for her finish as well as her strength. The mouldings and panels of her cabin are in cherry, walnut, and ash, beautifully contrasted. The floors are carpeted with Oriental rugs an inch thick. There is a set of solid silver on the sideboard and no end of rich and beautiful decorations about the bulkheads. The curtains before the berths are of silk, and the furniture of the after cabin is upholstered in silk also. The house forward is divided between the cook and the crew. Although Jack will have no silk curtains before his bunk, he will find a lot of comforts which he seldom finds in coasters, and which he will like much better than silk hangings.

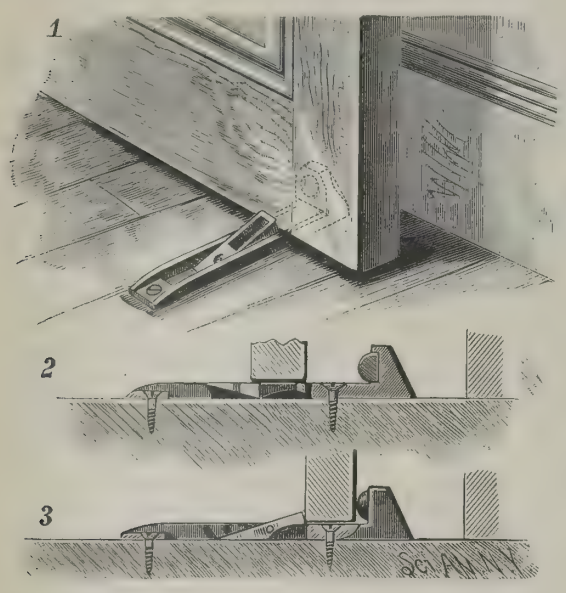
The Converse is commanded by Captain James M. Seaman, a Saville man. In all matters pertaining to the handling of the ship, he is the boss, but it is pretty plain to a visitor that in domestic matters his handsome little daughter Maude, a lassie of eleven years, is the ruler. Captain Seaman formerly commanded the Tingue, a famous schooner, and little Maude sailed more thousands of miles in her than she is years old. Maude helped launch the Converse by breaking the wine bottle over the knightheads in the presence of 5,000 enthusiastic spectators. The state room which this young sailor girl calls her own is as large as the captain's, and quite as handsomely decorated.

A friend of Captain Seaman told a reporter that the Converse cost $38,000—a figure that compares with the cost of a square-rigged vessel of equal capacity in a way likely to make old-fashioned ship owners open their eyes. The Tingue, which Captain Seaman commanded last, paid twelve per cent net profit while he was in her. The Converse is expected to do rather better, in spite of the hard times. One reason for expecting this good fortune, the captain says, is that he found upward of sixty horseshoes while superintending her construction, and he picked them all up and stowed them away. He never passes a derelict horseshoe. He owns one-eighth of the new vessel.—*N. Y. Sun.*

THE construction of sash windows forms the subject of a patent issued to Messrs. Vaclav Klan and Rudolf Seitz, of Prague, Bohemia, Austria-Hungary. The invention is for windows having an upper and lower outer and an upper and lower inner sash, all the sashes being mounted to slide and to swing on pivots, and counterbalanced by weights in such manner that they can be swung inward on hinges to facilitate cleaning or repairing.

IMPROVED DOOR CHECK.

This simple device is for arresting the motion of a door while being opened and for fastening it in an open position. The base plate is formed with a longitudinal slot extending through the greater portion of its length, and has at one end a right angled arm, formed with a chamber for receiving an elastic buffer. In opposite walls of the slot are formed series of diagonal slots, inclined away from the buffer, and to the slot is fitted a latch having, near its center, trunnions, which may be placed in any pair of diagonal slots, according to the thickness of the door. The



HINKLE & JEFFERY'S IMPROVED DOOR CHECK.

weight of the latch is so distributed that, normally, the end next the door will project above the plate and into the path of the door. The door check is secured to the floor with the buffer at the point where it is desired to arrest the door when opened, and the trunnions of the latch are placed in a pair of the slots, so as to leave a space between the end of the latch and the buffer, about equal to the thickness of the door. When the door is opened, it glides over the latch, as shown in the sectional view, Fig. 2; and when the door has passed the latch, the lighter end of the latter rises in front of the edge of the door, and holds it in an open position, as shown in Figs. 1 and 3. The latch is operated by gravity alone, and the check is not therefore liable to derangement.

This invention has been patented by Messrs. W. A. Hinkle and F. C. Jeffery, of Galveston, Texas.

THE ST. PAUL ICE PALACE.

The general form of the palace resembles somewhat a Latin cross. It will cover about 42,000 square feet, being 217 feet long by 194 feet wide. The grand central tower will be octagonal in shape, 50 feet in diameter and 105 feet high. The building will be a roofless shell, the surrounding walls averaging 23 feet in height. The main entrance will be in the form of a triumphal arch, surmounted by a sitting figure of King Borealis with his attendant bears (rampant) at either hand, all to be carved in ice. This archway will be 16 feet wide and 15 feet high. The wall will be 9 feet thick. The wing forming the foot of the cross, in which will be the main entrance, is circular in form, 95 feet in diameter. Each of the other wings, forming the head and arms of cross, will also terminate in an entrance, but of minor importance. The whole affair will be pleasing in effect and magnificent in proportions.

Our engraving is from the *Northwestern Architect and Improvement Record.*

THE ST. PAUL ICE PALACE.

Plain Wall Paper for the Sick Room.

In a recent lecture on nursing, Miss Kelman illustrated the need of having the walls of hospitals of a quiet and unobtrusive color, by telling an anecdote of a patient —an old gentleman—who was heard continually muttering "Fourteen up, thirty-five across." This fact arrested the attention of the doctor and nurses, who examined the room and ultimately found that the pattern of the paper was divided into squares of fourteen up and thirty-five across. When the old gentleman fell asleep he was quietly removed to another room, where, the wall paper being of a neutral tint, he quickly recovered.—*The Hospital.*

Explosion of Wood Dust.

We take from the Ohio *State Journal* the particulars of the recent explosion that occurred at the Columbus Buggy Co.'s works.

The catastrophe occurred in building No. 4, on Front street, being the west portion of the works, and the building just erected as an engine and boiler room on the lower portion, with the Backus dust arrester on the top floor. This is 20 by 40 feet, and was put in at great expense, being used to collect the dust from all parts of that building by means of shafts, the action of its machinery drawing it up to the arrester and shaving vault. From there a great chute extends to the engine room below, divided into two apartments. All is made fire proof. Through this chute the shavings and dust from above are swept at proper times, falling to the engine room, where they are burned. There are two doors, one in each apartment of the chute, opening into the engine room. Into one the shavings fall, and that door can be opened without danger, but the other should never be opened while the dust was being thrown down from the vaults above. An examination shows that disregard of this was the cause of the disaster, and all of the theories previously published are entirely wrong. It appears that at the noon hour, while the machinery was not going, Joseph Brown, colored, went into the arrester as usual to sweep it out and throw the dust down the chute. While he was thus engaged the fireman below, in violation of the rules, is said to have opened the door of the apartment into which the dust was falling. As he did so the dust puffed out in greater quantities, covering him and filling the engine room. The furnace fire is but six feet away, and the dust, which is very combustible, and being so fine as to act almost like powder, made, as it were, a train, which ignited and carried the flames to the chute, thus causing the explosion. As the force of the explosion shot up through the chute and into the arrester, thus extending in all directions, the roof was blown skyward, and the walls of that portion of the building were scattered in fearful destruction. The large quantities of brick, mortar and heavy timbers fell with crushing force upon some of the smaller buildings below, doing considerable damage, and played great havoc with the telephone and telegraph wires and poles. Brown was blown into the air and fell on the roof of another lower building, where he crawled from the debris, badly burned and with considerable skin torn from his hands and neck. He subsequently died.

The damage was confined to the walls of the large building, its roof, and roofs of the lower buildings. Loss, $3,000.

COMFORT AND STYLE TOO.

So long as it is the fashion for ladies to wear bustles of the pronounced amplitude now favored by so many

COMBINED STOOL AND BUSTLE.

of the fair sex, we do not see why the fact may not be taken advantage of to introduce an invention calculated to make it convenient for them frequently to rest from the fatigue of long standing or walking. Such, at least, we presume to be the idea of the inventor of the device shown in the accompanying illustration, for which a patent has recently been issued. The transformation the style has effected in the appearance of a lady properly fitted out in walking costume is something really wonderful, and we are not surprised, therefore, that several other inventors have rushed into the same field, with devices which would not otherwise have been thought of.

Sliding Blinds.

Mr. William Willer, of Fourth and Cedar Streets, Milwaukee, Wis., has lately issued a series of very complete catalogues of his patent sliding blinds, folding blinds, screens, and screen doors, all of which are represented in a great variety of designs.

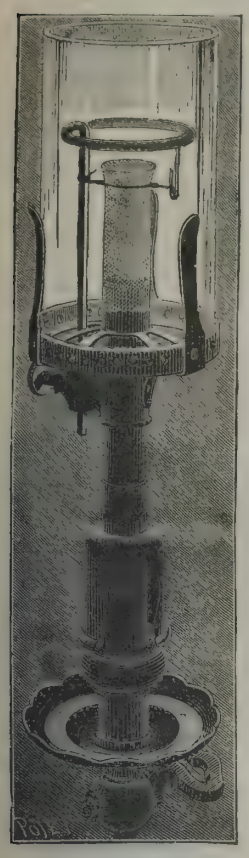
The patent sliding blinds are made in from two to six sections, to move up and down in the same manner as the sashes instead of being hung in folds on hinges. The different sections are $\frac{5}{8}$ in. thick, connected by mortise and tenon joints, and are balanced by springs. They act independently of one another, and are not connected by cords or otherwise. The slats are arranged to move, so that light may be admitted without the necessity of moving the separate sections.

Included within the catalogues are a large number of full size sections of guideways, stops, and mouldings, forming as complete and well illustrated a list as we remember seeing in some time. The prices included within the list compare very favorably with those of other firms, and we recommend those of our readers who use this class of goods to send for a copy of the catalogues, which we believe are sent free of charge.

For brassing small articles: To 1 quart water add half an ounce each of sulphate copper and protochloride of tin. Stir the articles in the solution until the desired color is obtained.

INCANDESCENT BURNER OF DR. AUER.

The peculiar feature of the gas lamp of Dr. Auer von Welsbach consists in the incandescence of certain metallic salts placed in the middle of the flame of a Bunsen burner. The principle is not new ; it is the same as that in the Clamond lamp, in which, as may be remembered, the incandescent substance is formed by a little thimble of magnesia threads. On the other hand, the arrangement of the Auer burner is very simple, and appears to possess many advantages. It consists of an ordinary Bunsen burner, the end of which is covered by a hood of cotton or woolen tissue washed in a special preparation. The hood, about 6 or 7 centimeters in height, is slightly flaring and is held by a platinum thread which passes around it and is fixed to two rods of iron connected with a ring above. The longer of the two is held by a thumb screw to the pipe which supports the burner.



NEW INCANDESCENT GAS BURNER.

As soon as the burner is lighted, considerable heat is generated within the hood, which, in a few seconds, becomes aglow with a whitish blue light, remarkable for its steadiness and intensity.

It is not perfectly well known how the hood is made, but here are a few details from the patent of Dr. Auer, which throw some light on the subject: Take a solution of zircon and nitrate or acetate of lanthanum or yttrium, and soak in it the woolen or cotton that is to form the hood. The tissue is then carbonized, and leaves a sort of network, which is applied to the Bunsen. The nets thus procured appear more favorable to the production of light than the massive cylinders of zircon tested in 1868 by Tessie de Mottay on oxyhydrogen burners.

According to the inventor, each hood costs about 1 cent, and will last 1,000 hours, or until the dust of the atmosphere is sufficiently incrusted thereon to diminish the strength of the light. Finally, with equal lighting power, the consumption of gas in the Auer burner will be about one-half less than that of an ordinary burner, which should show an economy of 50 or 100, but these figures ought to be verified. The durability of the hood ought also to be determined by exact tests.—*La Nature.*

JOSEPH ECHTELER'S DESIGN FOR A GRANT MONUMENT.

Fourteen competitive designs for a monument to General Grant, to be erected in New York, have been sent in, and among these the design of a German who has lived in America for two years is especially noteworthy. Thinking that many of our readers may be interested in the design of Joseph Echteler, we give a cut of it, taken from the terra-cotta model.

The monument is to be about 71 or 72 ft. high, the lower part consisting of a mausoleum. It will cost about half a million dollars. The memorial is crowned by an equestrian statue of Grant. This represents the General as commander, riding to battle on a rearing horse, his cloak flying, and his head turned to look back, while he points in the direction of the enemy with a field glass held in his right hand.

At the four corners of the cap or upper part are four female figures representing Peace and Prosperity, Industry and Invention, Commerce and the Marine, Statesmanship and Law. On the front is a battle scene, Grant with outstretched sword riding at the head of a column of infantry, while at the left the cannoneers are busy firing the guns. At the back of this upper part, the North and South are represented as engaged in a mortal hand to hand combat, and in the midst of the confusion of the battle rises the imposing figure of a commanding general of the Southern army.

The group in the middle part of the monument is specially well conceived ; two female figures, the North and the South, grasp hands in token of eternal friendship. The North is represented as having beautiful classic features and wearing the Phrygian cap--she is laying the palm branch of peace on the shattered weapons of war ; while the South is characterized by features of the Southern type and light clothing, the figure being partly nude—she is laying a laurel wreath at the feet of an eagle whose outstretched wings spread over the scene. The background of this principal group is filled with an architectural design of arches.

On the opposite side of this part of the monument is the figure of General Grant in uniform and fully equipped for war. He is seated with his left hand on his sword, and about him and on a staircase behind him are grouped the members of a negro family. The negress, on whose wrists the fetters are still visible, raises her hands to Grant, praying him to deliver her from slavery, while the negro tries to express his gratitude by pressing the General's hand, resting his left hand on the forearm of his deliverer. In the foreground a little negro boy is playing with the broken chains. The left face of this portion represents, in high relief, the scene under the memorable tree at Appomattox, where General Lee surrendered his sword to the victor Grant. In high relief, at the right, the artist has shown the steps of the White House at Washington. On the upper step Grant is taking the Presidential oath before Chief Justice Chase, while in the background stand Grant's predecessor, Johnson, and several Senators, as witnesses. The front of the principal part of the monument bears the inscription, "Gen. U. S. Grant." The coats of arms of the different States are arranged on the under socle.

The mausoleum, which is 59 feet in depth, is provided in front and at the back with three terraces. The cap of the monument, the main part of the mausoleum, the portals, and the balustrades are to be made of polished granite, the foundation of rough-hewn stone, and the figures and coats of arms of the best bronze. The completion of the work would require about five years. —*Illustrirte Zeitung.*

Disinfection by Heat.

The disinfection of articles of clothing, and of dwellings, after infectious ailments, is admittedly one of the most important duties which attends the work of preventing disease. A recent report of the medical officer of the local government board, London, presents the entire question of the destruction of germ life in a new aspect, including, as it does, a memoir on disinfection by heat, from the pen of Dr. Parsons. The degree of dry heat necessary to kill the germs of diseases well known to be infectious was first investigated. The bacilli of splenic fever, for example, were killed by exposure for five minutes in a dry heat varying from 212° to 218° F., but their spores did not yield to two hours at 220°. One hour at 245°, and four hours at 220°, achieved the result. Some very remarkable practical instances are given of the difficulty with which dry heat penetrates such articles as bedding, blankets, and pillows. For example : A thermometer enveloped in a roll of flannel, placed in a hot air bath at 212°, only registered 130° at the end one hour ! Dr. Parsons demonstrated by numerous experiments that steam at or above 212° possesses a very much greater power of penetration and disinfection than dry heat, and that, where actual steam cannot be employed, moistening the air of the heated chamber materially reduces the time required for efficient disinfection. Apparatus for thus treating the clothes, etc., of the sick poor ought to be a feature of the municipal arrangements of every city.

ECHTELER'S DESIGN FOR THE GRANT MONUMENT, NEW YORK.

A PRETTY COTTAGE FOR $1,000.

The precise figures of the estimate for this picturesque and tasteful dwelling, as given by the designer, Prof. U. W. Hart, of New Haven, Conn., are $936.32. This must be regarded, of course, as the minimum price; and in carrying out the plans most persons, unless in especially favorable localities, will find it difficult to stop short of $1,200; but we put the figures at $1,000 as the least for which we should wish to undertake its erection for ourselves.

The entrance hall, not being large enough for a reception room, is placed on the side, where its front door and staircase are nearest to the work-room, and to the parlor as well. Under the front stairs are stairs that lead to the spacious cellar, which runs under the whole house. On entering into the kitchen, it will be found that it is both kitchen and pantry, and in the various closets surrounding will be found places for every article used in these two rooms, right where they are needed. Near the portable range is a closet for all the stove and iron mongery of the house. Between the kitchen and dining-room will be found, next the floor, three drawers for table linen, opening into the dining-room; next above is one drawer for spices, etc, opening into the kitchen, and close by the mixing table, which is in front of the window; and over this last drawer are shelves for dishes, opening from both kitchen and dining-room, and inclosed with doors on each side. At the left of the window is another inclosed closet for provisions of all kinds. Between the window and the door opening to the back of the house is a table inclosed below for the flour barrel. In this combined kitchen and pantry, all drawing out of the table and traveling to and from the pantry, bringing and returning the articles three times per day, is avoided

The little parlor of this house is intended to be the family sitting-room, and the kitchen and dining-room are so arranged that the family work can be done in them without observation. The dining-room communicates with both the other rooms in such a way that it will be warmed from them sufficiently for its proper use.

The second floor will be found to be planned with equal care. A small stove in the upper hall will add greatly to the comfort of all the chambers; and the hall, with its closet, will make a very convenient sewing-room. But those who wish can utilize this space for a bath-room. From this hall, stairs ascend over the other stairs, to a commodious store-room in the attic. Each of the three chambers is provided wfth a closet and two windows, thus securing good ventilation.

The height of the ceilings is 8½ feet in the clear in the first, and 8 feet in the second story.

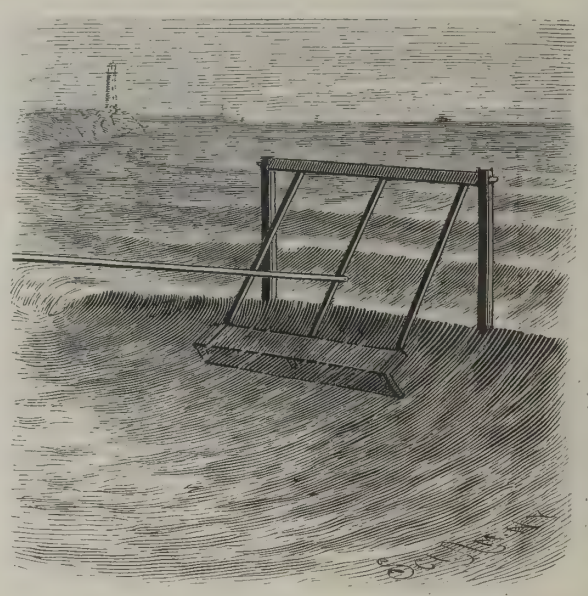
The purpose of this design, to state it briefly, is to make a home of which its occupants may be proud, even though it be situated in the midst of more pretentious and expensive neighbors. —*Amer. Builder.*

STAINED WOODS.

Probably the most artistic and sensible craze that ever reigned among and over architects and their clients was that for the use of woods in their natural finish, but this has had its run. However, it took so deep a hold, perhaps because it was really artistic, the reaction is but slight, and there succeeds a craze for stains which extends to woods hitherto untouched by paint. The principal sufferer will be oak, the most durable and one of the handsomest of American woods. "Antique oak" embodies almost as much toadyism as a coat of arms, and is quite as repugnant to a refined American taste, for its use seeks to convey the idea that its possessors have an unbroken family record reaching so far back that age has stamped its impress upon their furnishings handed down from father to son in good old aristocratic style. Moreover, all such attempts at beautifying nature's most perfect workmanship are unsuccessful. We have become so accustomed to stained cherry, few know that this wood is not red, red as the setting sun, and certainly many architects do not appreciate the elegance of grain and color and marking shown in its natural state. The same is true of many other woods. Shall we not hope that the slight reaction manifest in the stain craze may be short lived, and the return to the beauty of the unadorned may mark an abandonment of all false methods and inaugurate a period of true artistic development among the people and their leaders in art?—*N. W. Architect.*

WAVES UTILIZED TO PUMP WATER.

I send herewith a description of a wave-operated force pump I constructed last summer, to supply my cottage with water, at Thousand Island Park, St. Lawrence River, N. Y. The water was delivered through a three-quarter inch pipe, 200 feet, with 40 feet elevation to tank. The power was obtained from the momentum of the waves, which proved ample.



HOW TO RUN A PUMP BY WAVE FORCE.

The first method by which I endeavored to obtain the power was by a float upon the water, which operated beautifully when detached, but when required to work, very little power was developed. I then hung a shaft, about six feet long, from supports anchored in cribwork, as shown in the sketch, and from the shaft suspended three arms, three feet long. Suspended from the end arms was a plank trough, six inches wide. Practically, the apparatus represented a six foot wheel, like the paddle wheel of a steamer, with barely one bucket, and that having a trough-like section. A cross arm at right angles projected from the central arm, to which was attached the pump. The incoming wave would impart its force or momentum to the swinging pendulum, carrying it much or little, according to the size. It was a surprise to see how small waves could do work; that is, little swells, which would swing the bucket but a few inches, would deliver a corresponding amount of water, frequently in drops rather than in a stream. Another lesson was learned by constructing the bucket eleven inches wide. At first, when a stream came sufficient to fill the bucket, there was not only a large waste of power, but great danger of destruction of the machine. Six inches proved to be the best width. For increase of power, increase in length is preferable. I am well aware that such apparatus might not be as practical as a windmill where heavy seas are liable to occur, as the construction of the piece to stand the shocks would be expensive. In this experiment the cost was not one-quarter that of a windmill, while the apparatus was out of sight. S. B. Palmer.

THE NEW ACADEMY OF ART IN MUNICH.

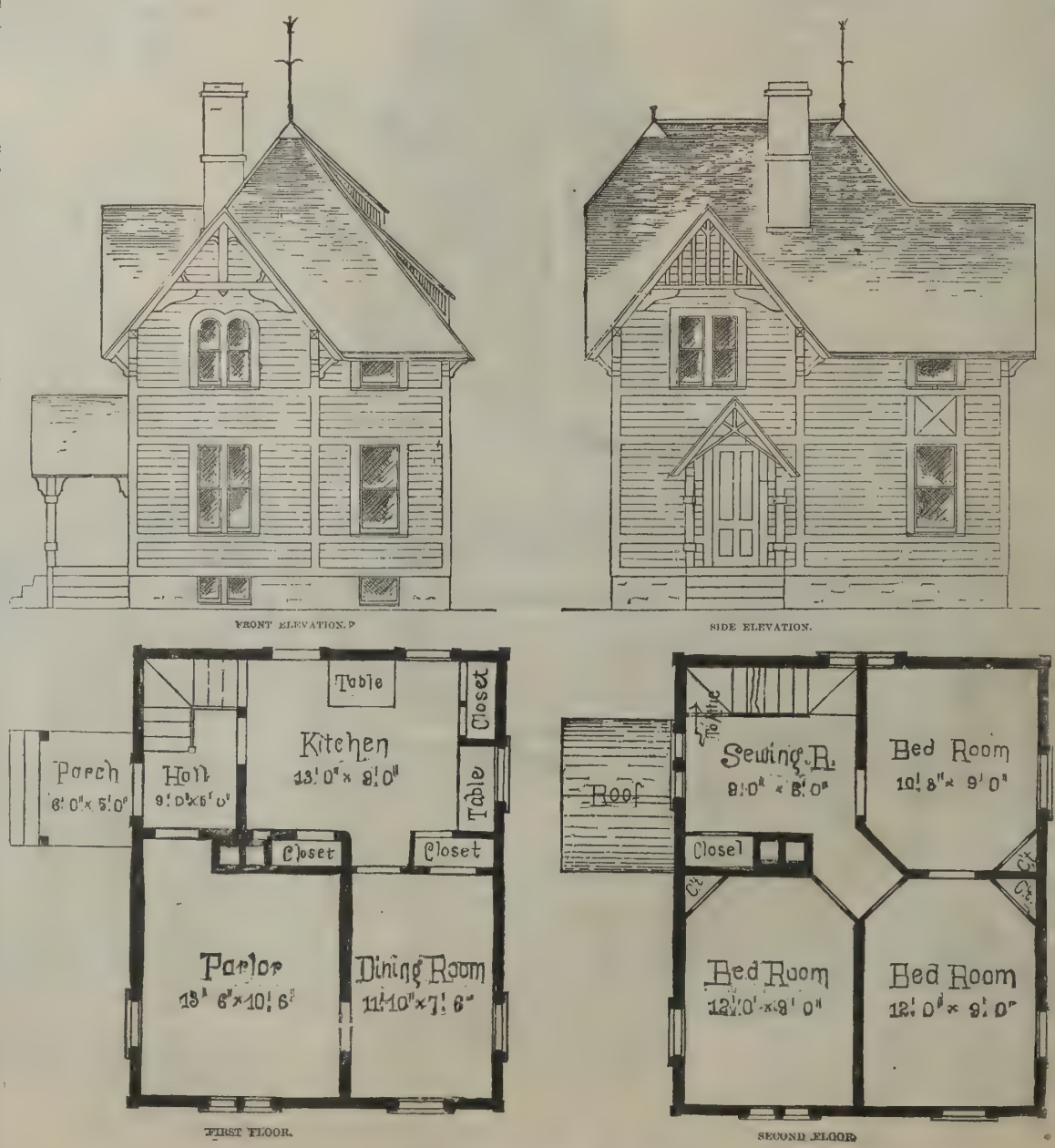
The new Royal Academy of Art in Munich, a splendid monument consecrated to the arts of peace, has lately been completed. In consequence of serious disputes between the Ministry and the Legislature, the money received as indemnity for the French war was withheld for a long time from the object for which it was to be expended; but finally, after a period of ten years had passed, the last scaffolding disappeared, and the newest monumental building of the Bavarian capital appeared in its imposing beauty. It is built in the noble style of the Italian Renaissance. The great architect Gottfried v. Neureuther created for himself a proud monument in this, which will probably be his last great work.

The choice of the site, on the north side of the city, near the triumphal arch, was, at first, considered unfortunate; but as the city has grown rapidly in this direction, all former fears that the Academy would be too remote have been removed.

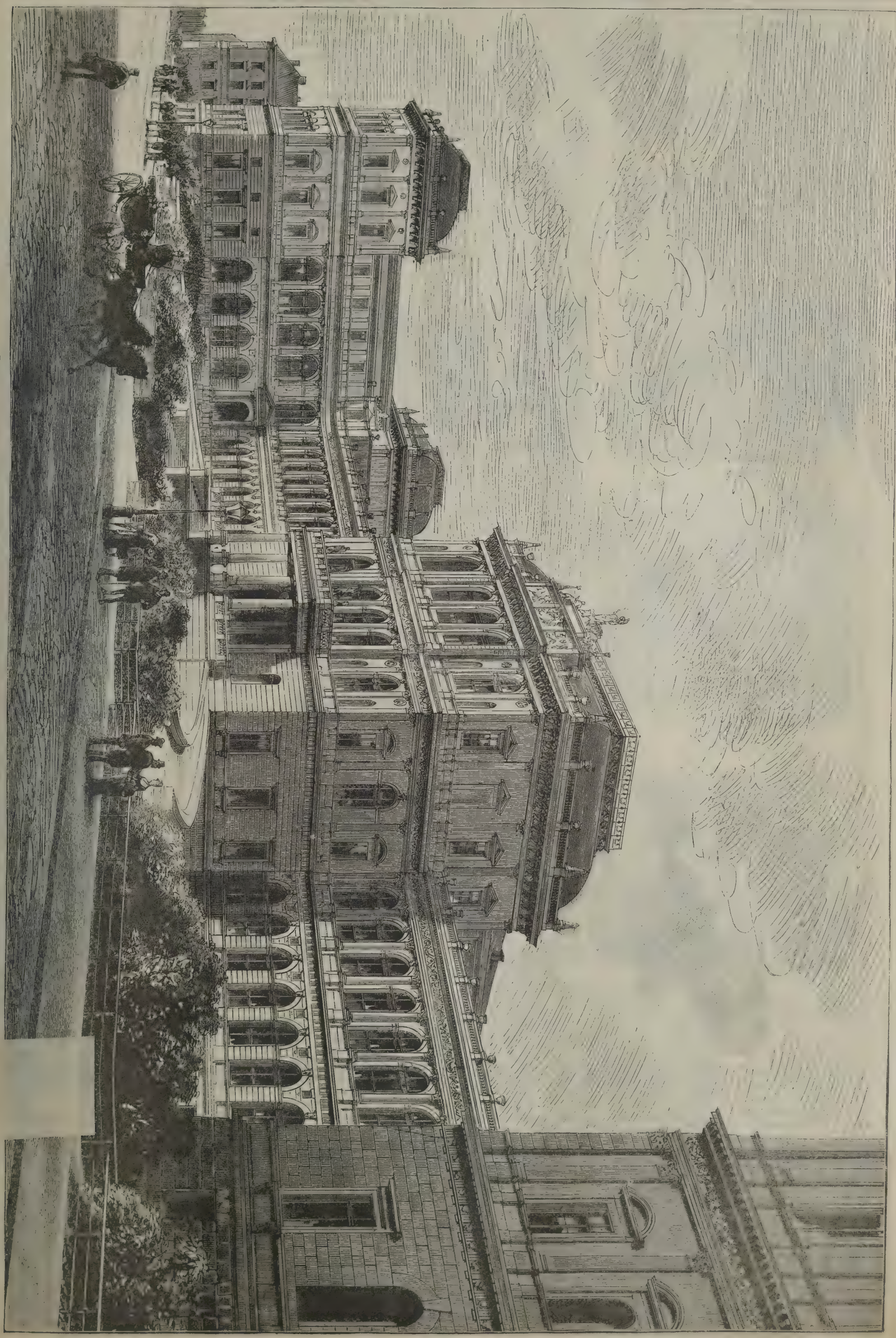
Broad steps, flanked on the right and left by the ramp, lead to the portal of the middle building, which is richly ornamented by plastic groups. (Minerva crowns the building, and on either side of her are the allegorical figures of Poetry and Science.) The imposing staircase forms a worthy entrance to this cradle of Munich art. By the great door of the main building, as well as by the doors of the wings, the lofty first story is reached. This contains all the halls for sculpture, the beautiful antique hall, part of the preparatory school of the Academy, and the archives. An elegant staircase leads to the upper gallery, which sweeps along the entire extent of the building, forming an artistic perspective. Here most of the studios of the professors, the school for copper-plate engraving, the painting and composing class-rooms, and the hall of architecture are located. The schools of the different masters, and the nature class-rooms, are in the next higher story, in the pavilions, and even in the basement. This high school of art possesses no assembly and exhibition hall, unless we can apply that term to the council chamber of the college, on the first floor.

The erection of this beautiful building is due principally to the energy of Piloty. During almost the entire period of the directorship of the dead master, efforts were being made to obtain this much-wished-for home of art instruction. It is scarcely a year since the celebrated director, with the institution under his care, moved into the new rooms, where his uncompleted work, "The Death of Alexander the Great," was begun. To-day a younger man, with a name long known to artistic circles, F. Aug. v. Kaulbach, conducts the school.

The Munich Academy has a high place to fill; for it must prepare a new ground from which a fresh artistic life must spring. The disciples of art flock to the Munich school from all parts of the world, and carry its fame back with them. The accommodations of this palace of art already seem too limited to receive all the believers, and yet this Bavarian Mecca of artistic youth has only just been completed.—*Illustrirte Zeitung.*



A COTTAGE FOR $1,000.



THE NEW ACADEMY OF SCULPTURE AND PLASTIC ART, MUNICH.

ILLUSTRATIONS OF GERMAN COTTAGES.

The house is the embodiment of the sentiment of the people; and while city houses are, to a great extent, affected by the influence of foreign culture, in all countries—and especially in Germany—the national house is that of the present, for it is necessarily influenced by the conditions of the national agriculture and the village life. As the Germans have always, since the time of Tacitus, preferred country life, they take special interest in the architecture of the old German houses.

The dwellings of the old Germans described by Tacitus are easily recognized in the modern structures of North Germany. The German buildings were not separated by a court and garden, as were those of the Romans; the whole establishment was under one roof, and the house was partly dug out of the ground—as is still the case in some villages of Northern Germany—and there were steps leading down into the interior. Such houses (see Figs. 2 and 4) are still to be found in Westphalia, Hanover, Pomerania, Mecklenburg, and Schleswig-Holstein. In the Holstein house, the smoke arisng from the fire has to find its way out through the door, or penetrates the grain which fills the interior of the immense roof.

The Wendish house resembles that of Saxony. It has a smaller hall, in which the hearth is placed, but it is customary to arrange a large living room back of this, which is lighted by side windows at the expense of small rooms. This plan is also followed in the South German peasant houses. The entire establishment is under one roof, but the dwelling is separate from the barn and stable, which have their particular entrances. Any one who travels through the Black Forest will notice the houses with great interest. Sometimes they are sheltered in the valleys, where they seem almost colossal as they spread under their pyramid-like roofs; and again they appear on the slopes of the mountains,

Creeping of Varnish.

We often meet with this trouble, especially in light-colored gears, where oil has been used in the colors, and in almost every case where oil and varnish are combined in the varnish and color. One way to get over the difficulty is to give the job two coats of the true color, and then a light coat of pure varnish without any in; but when you cannot take the time for that, and are compelled to have your varnish and color strong, you can adopt the following two plans, which we have found have answered the purpose. As creeping is caused principally by sweating, which throws off from it instead of attracting to it, we must try and get rid of that false tack, which is nothing but a thin crust of oil held in its place by the other ingredients in the color, just as gold sizing standing over night exposed to sulphur from the stove will have a thin coating of sulphur; and although you might lay the gold on, and to all appearance it would be all right, yet if you attempted

1. Holstein Peasant House. 2. Westphalia and Saxony Peasant House. 3. Schleswig Peasant House. 4. Frank Peasant House. 5. Swiss Peasant House. 6. South Germany (Black Forest) Peasant House. 7. Further Pomerania Peasant House. 8. Thuringia-Frank Peasant House. 9. Wendish Peasant House.

ILLUSTRATIONS OF GERMAN PEASANTRY COTTAGES.

With the migration of the races began the contest between the styles of houses used by the different races. The various types of houses are shown in the accompanying cuts, taken from the latest edition of Meyer's "Conversations Lexikon." The form of house built by the Franks has gradually come to be that most used. In this style of house the interior is divided into different rooms, and the apartments for the people, the cattle, and the provisions are not grouped under one roof around a middle space where all kinds of work are done, as in the houses of other German races, but the various compartments are separated by partition walls, the stable and barn being provided with special entrances.

In the dwellings of Westphalia and Saxony, the housewife, from her central position by the hearth, or from her sleeping place back of the same, can keep her eye on her children and servants, her cattle and horses, watch the cellar, garret, and living room, and still go on with her spinning and cooking. Near the principal house are smaller houses for the field hands, the gardener, or the aged parents. These are built on the same plan as the larger house, but are smaller, to correspond with the lesser needs of the occupants half hidden by the trees. These Black Forest houses are three stories high. In the basement, the walls of which are masonry, are the stables; the second story is built of wood, and contains the living rooms and chambers; and above that, in the great roof, the grain is stored.

In several of the Swiss cantons, the same roof covers the dwelling, the stable, and the barn, but in these houses two stories are used for the dwelling. These stories are reached by outside stairs and corridors which are protected by the roof. In the Berne district, the kitchen is in the center, as in the Saxon houses; but in central Switzerland and in the mountainous districts the dwelling, stable, and barn are separate buildings. This use of separate buildings is also found in the Thuringen-Frankish houses, such as we see in Thuringen, Hesse, the Palatinate, and Rhenish Prussia. Here the buildings are arranged around a court which they completely inclose.

In upper Bavaria the stately and solitary buildings look like wooden fortresses, and, in fact, many of the mediæval castles of Southern Germany were built on the same plan as these peasant establishments.—*Illustrirte Zeitung.*

to wash it off, you would find the gold would leave solidly.

The oil in the color acts in conjunction with the varnish just the same; the oil, being lighter in body than the varnish, rises to the surface, and, although seemingly hard, has that false gloss and tack which must be taken away before you can proceed. Where you cannot with safety rub it off, without running the risk of marring the looks of the job, take castile soap, and, instead of rubbing it, wash it. It is best, if you can, to take each part separate, except when you are varnishing, which in that case involves the washing of the whole job at once. You should always wipe off with a medium damp chamois skin, one not too dry, so as to retain enough dampness to insure safety. Even after you have gone through the above, if, after all your trouble, you still find places that have probably been missed or slighted in the washing, and detect the creeping, just throw a little pure water into your varnish, stir up thoroughly, and proceed just as you would if you had no trouble. Sometimes the creeping will occur in spots, and can, in striping, be stopped by breathing heavily upon the place, running over it at once with the stripe.—*Carriage Monthly.*

A FEVER HOUSE.

In the annual report of the New Hampshire State board of health for 1886, Dr. A. H. Taft, of Winchester, reports that on May 5, 1885, a lady patient gave birth to a son. Convalescence protracted. Child "brought up" on bottle; deranged condition of bowels from the first. Mother and child in a miserable condition for two months. Upon examination, the sink drains and the well were found to be separated by but about six feet of very porous earth, as may be seen in the illustration. The condition of both patients remained unimproved until the use of the water on the premises was discontinued, and this was brought about only by

A FEVER HOUSE.

calling the attention of the State board of health to the condition of affairs.—*Sanitary News.*

One Reason why Paint Chips off from around the Spokes in the Hubs.

We are often asked by parties who ought to know for themselves, why paint chips off of the hub and along the edges of the spokes. They claim that they have used the best material both in the leads and oils, and yet they have that trouble. We ourselves have often seen jobs that have been out but a short time, and all gone in spots; the trouble has been caused in nearly every case by carelessness: 1st, on the part of the wheelmaker who made them, and 2d, on the part of the painter or apprentice who primed the wheels. The wheelmaker was careless, because he failed to clean all the glue off when he drove the spokes. It does not answer the purpose to claim that he took his sponge and, dipping it into the warm water, washed it off. He did not get it off as thoroughly as he should. In using his sponge once or twice, he will find that he has thoroughly impregnated it with the glue, and instead of removing the glue he has merely spread a thin, almost invisible, skin over the hub. The wheel goes to the paint shop and then falls into hands of an apprentice to prime, and unless there should be an extra large piece adhering to the hub, he fails to see anything wrong, and without further investigation proceeds to cover the skin of glue with his oil priming. The wheel stands around quite a sufficient time to allow the priming to dry before it is ready to be finally painted, although the oil and lead has not been able to penetrate through the glue. He thinks because he can sand it off when he gets it, it is right. The wheel is finished and goes out into the weather. As soon as the dampness from any cause strikes through the paint, it loosens the skin of glue, ıd away goes the paint, pecially if the job sees ırd driving.

The remedy for all this very simple. If the heelmaker would use two ɔonges, instead of only one, when he washed the glue off, and have the second sponge used only in fresh water, apart from that which he has in the glue kettle, he would avoid all the trouble. The apprentice, or whoever primes them, should not take it for granted that, because it looks clean, and he cannot see anything out of the way with it, it is all right. That is where he makes his mistake. He should be thoroughly satisfied as to the proper condition of the job before he proceeds any further. In order to be so satisfied, he should carefully sandpaper the wheels all over, and especially between and around the tenons on the hub. He should examine his paper, and if any hard spots appear on the paper, with a smooth, glazed appearance, he may depend upon it that there is glue upon the hub, and should see that it is all removed. When his paper brings the wood away with it in a fine dust, he is then all right, and not before.

In regard to the edges of the spokes, that is principally caused by the party who brings the job up. For instance, if he has been in the habit of cutting his edges through every time he has prepared the job for a coat, and failed to oil the exposed places, the colors that are placed on top at those places have no foundation or anything to hold them, and, consequently, as soon as they are brought into contact with the atmosphere, they are quickly destroyed, the life dried out, and they are dropped off by friction through vibration in driving, or rubbed off through washing. The edges should never be cut through in the first place. There is no necessity for it if ordinary care is exercised, but if they are by any means exposed, they should always be rubbed over with a little pure oil. It is not particular about the oil drying before the next coat is placed on. That would take up too much time. The coat can be put on immediately afterward, without any danger, as it does not require the places to be soaked in the oil, only rubbed. It is never good policy to compel an apprentice to so hurry in priming as to slight the job to get it done. Better use a little extra time and do it right, than to meet with trouble afterward.—*Carriage Monthly.*

The Grindstone Industry.

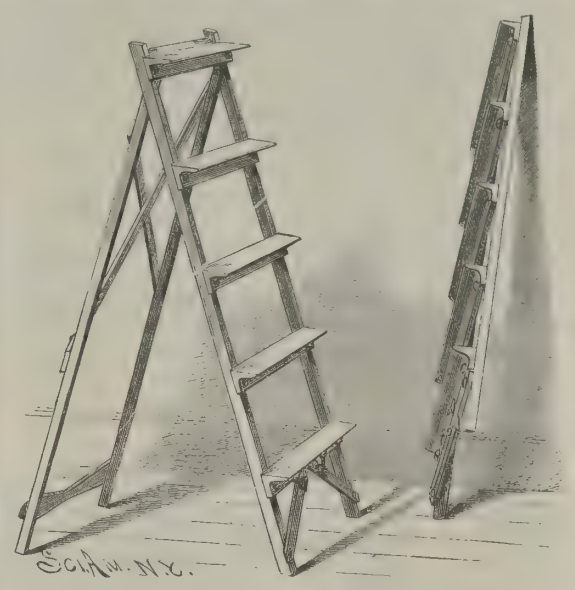
A correspondent of the *Portland Transcript* gives a description of a visit to the Bay of Fundy and along its shores, where the grindstone quarries are located. The superintendent of the quarry says when the tide is out his men go down on the rocky shore and work out near the water. At low tide the men on the shore drill some holes in the ledge, put in powder, and blast out great pieces of rock. When the tide rises again, they float out some big logs and empty barrels over where the loosened rocks are. When the water goes down again, they fasten a big rock to the raft with heavy chains, so when the tide again rises it lifts up the raft and the rock with it. Then they tow it as near the shore as they can. If it is the right kind and size for a millstone, sometimes it is allowed to lie there until the workmen, with stone chisel and hammer, work it into proper shape. At other times, by means of a derrick, it is drawn out on the wharf. Then it is rolled on a track and hauled to the factory.

At the great stone factory the large piece of rock is placed on a carriage, and, with a saw similar to the up-and-down saw in a mill, the rock is sawed into great slabs of the right thickness for the grindstone. The saw does not have teeth, but wears its way through the rock with the aid of sand and water, which are continually poured on. Then the slabs are taken, a hole made in the center, the edges trimmed off with a chisel, and the whole placed on a kind of lathe, turning it until it is true and the edge smooth. A grindstone that "wabbles" is not worth much.

The rock from which grindstones are made is a kind of sandstone, and there is a great difference in the "grit," some being coarse and some fine. Often several different degrees of "grit" are found in the same quarry. There are many quarries along the shores of the Bay of Fundy. The reason stone is taken from under the water, when there are many quarries a little distance from the shore, is because the best stone comes from the bottom of the bay, where it is covered at high tide.

FOLDING STEP LADDER.

The accompanying cut represents a folding step ladder, opened and closed, made of hard wood and inge-



RUSSELL'S FOLDING STEP LADDER.

niously bolted and braced in such a manner as to form a strong, complete, useful, and handy ladder.

When folded it occupies a space of only four inches, so that it may be put in the pantry or behind any door where it will be out of the way, and yet be within convenient reach, thus saving the trouble of searching the cellar and garret, and perhaps finding the ladder in the yard in a condition unfit to be brought in the house. This compactness is of advantage to dealers, owing to the small amount of space occupied and the low cost of transportation. When used by painters, it can easily be carried under the arm, and for use as an article of household furniture it can be converted into a very neat hall rack.

This invention has been patented by Mr. H. C. Russell, of 240 Robert Street, Toronto, Canada.

THE WISTARIA.

(W. SINENSIS.)

How much a simple building may be beautified by a good climber is shown by our engraving of an old wistaria on a modest cottage, the office of Mr. Virgo's nursery. The tree was planted by Mr. Virgo nearly fifty years ago, and, judging from its vigor—for the engraving shows only half its extent—it seems to promise endurance for perhaps another half century. The crop of blossoms was this year not a very full one, as was the case with most of the wistarias in the district. In a year of good bloom the little house looks almost smothered with the pretty lilac bunches.—*The Garden.*

WISTARIA ON MR. VIRGO'S HOUSE, WONERSH, SURREY.

THE recent development of the Mount Lyell gold discovery bids fair to eclipse anything of the kind hitherto found in Tasmania, and even to rival the famed Mount Morgan of Queensland, the value of which is counted in millions. Mount Lyell is about seventeen miles northeast of Macquarie Harbor, on the west coast of Tasmania. Further prospecting has revealed to some extent the extraordinary richness of the deposit. It would appear at first sight to be a dike formation; but its exploration so far indicates that it is of hydrothermal origin, like the celebrated Mount Morgan mine. Several assays have been made, giving magnificent results. Three are known that were respectively at the rate of 164 ounces, 187 ounces, and 348 ounces to the ton.

THREE CITY HOUSES.

The block of city houses illustrated was designed by J. Averit Webster, architect, 110 E. 125th Street, New York city. They have been erected on the north side of 133d Street, between 5th and 6th Avenues, for James O'Kane, Esq. The fronts are rock-faced Connecticut brownstone to the parlor floor, and above Philadelphia pressed brick, with brownstone and terra cotta trimmings. The cornice is entirely of terra cotta.

While the judicious use of terra cotta has given an ornamental impress to the fronts, the most striking and pleasing features are found in the round-arched doorways and windows of the parlor floor, and the triple windows of the second and third floors. The windows with the stone balcony, in the middle house, not only please the eye from without, but make the room they light the pleasantest in the house; a room that will receive the full benefit of the sunshine, even in mid-winter.

Stained glass is employed in the windows of the front sufficient to give a pleasant effect, yet not to that extent that becomes tiresome to the eye. The front doors are of cherry and light oak, with carved panels. Moulded stained glass is substituted for the upper panels of the doors.

The interior is arranged in the following manner: Dining-room, 11x18, in front of basement; kitchen, 13x15, in rear. The remainder of the basement is occupied by stairway, pantry, closets, etc. The parlor floor contains two parlors and staircase hall. A bay window nine feet wide and four feet deep, the full height of the room, opens into and forms a part of the rear parlor. This room is provided with a butler's sink, and communicates with the kitchen by a dumbwaiter.

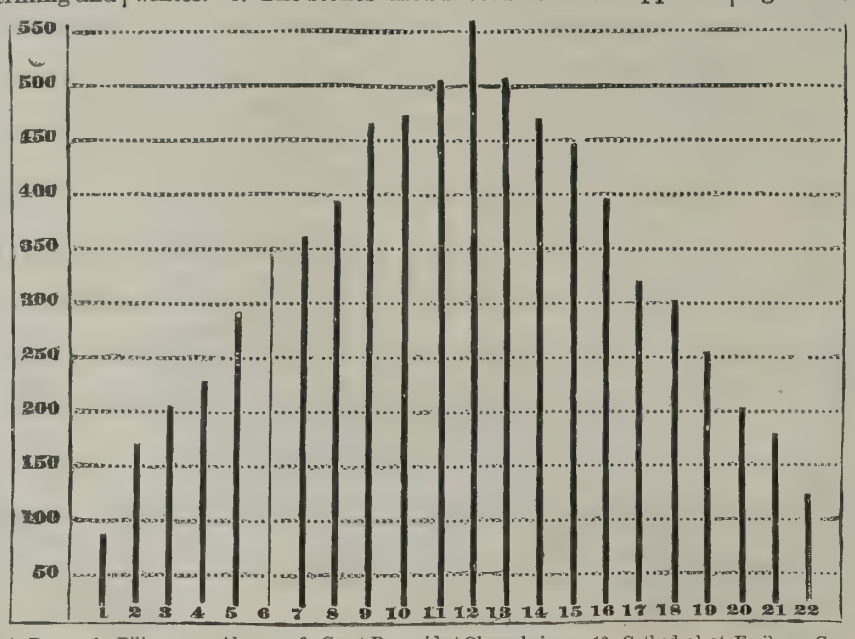
On the second floor are two large rooms (each with a separate dressing-room, provided with marble top washstand and ample wardrobes) and a bath-room. The middle house has three sleeping-rooms on the third floor, and each of the others four.

Dining-room, parlors, and entire second floor are trimmed in hardwood, kitchen in Georgia pine, and third floor in white pine.

The houses are heated throughout with brick-set furnaces, and the principal rooms are also supplied with open grates.

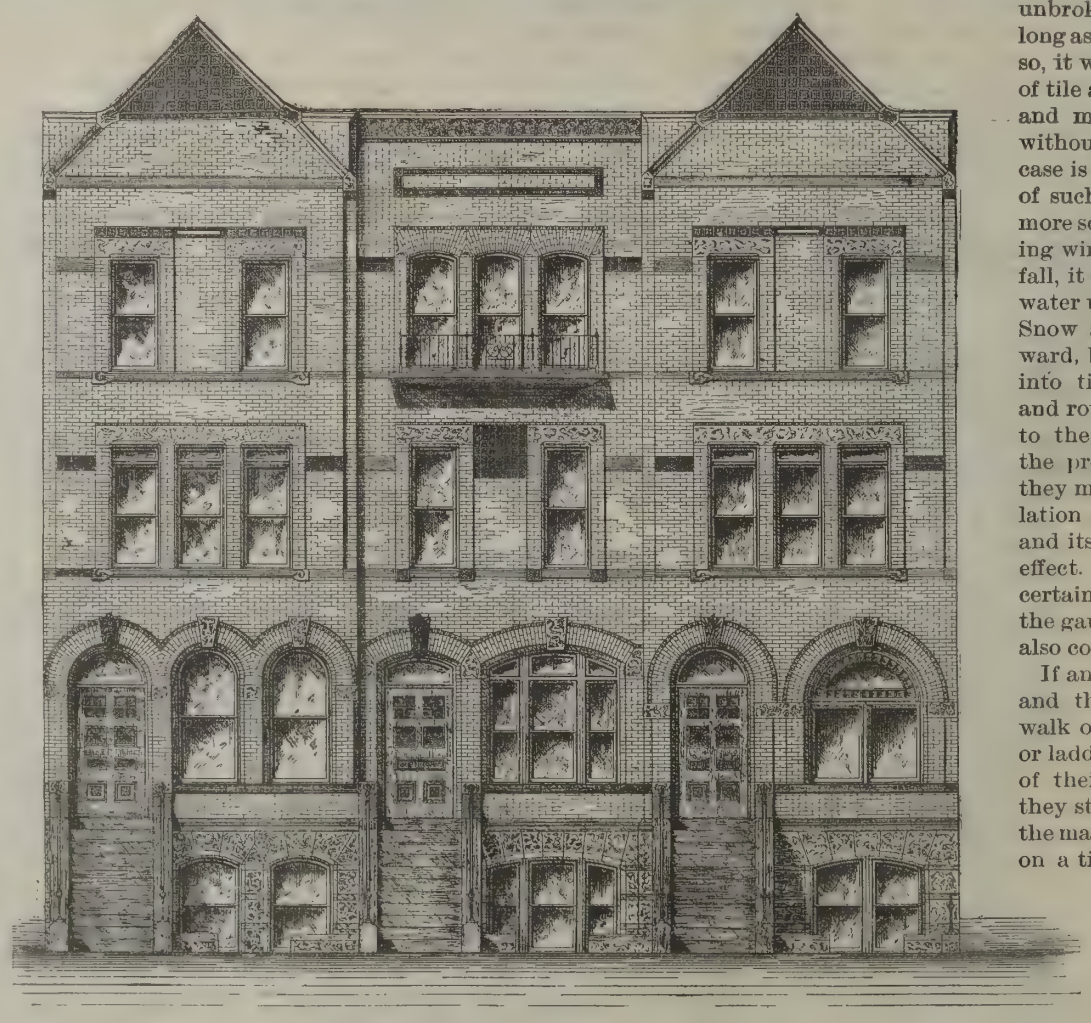
Each house is 16 ft. 8 in. wide by 40 feet deep. The basement is 8 ft. 4 in. high, the parlor floor 11 feet, second floor 10 feet, and third 9 ft. 6 in.

The cost is about $8,000 each house, exclusive of land.



1. Pompey's Pillar, near Alexandria, Egypt, 94 ft.
2. Niagara Falls, New York and Canada, 164 ft.
3. Cathedral (Minster) at York, Eng., 198 ft.
4. Bunker Hill Monument, near Boston, Mass., 221 ft.
5. Capitol at Washington, D. C., 287½ ft.
6. Bartholdi's Statue of Liberty Enlightening the World, 341 ft
7. St. Paul's Cathedral, London, Eng., 360 ft.
8. Cathedral at Antwerp, Belgium, 403 ft.
9. Great Pyramid at Gheezeh, in Egpyt, 460 ft.
10. Notre Dame Cathedral at Rouen, France, 470 ft.
11. Cathedral at Cologne, Germany, 510 ft.
12. Washington Monument, Washington, D. C., 555 ft.
13. Old St. Paul's Church, London, Eng., 508 ft.
14. Cathedral at Strassburg, Germany, 468 ft.
15. St. Peter's Church at Rome, Italy, 448 ft.
16. Cathedral at Freiberg, Germany, 385 ft.
17. Board of Trade Edifice, Chicago, Ill., 320 ft.
18. Big Trees, Calaveras Co., California, 300 to 330 ft.
19. Central Spire of Cathedral, Lichfield, Eng., 250 ft.
20. The Monument, London, Eng., 202 ft.
21. The Albert Memorial Monument, London, Eng., 180 ft.
22. Temple of the Sun, Cuzco, Peru, S. A., 120 ft.

HEIGHTS OF VARIOUS OBJECTS.



A BLOCK OF THREE CITY HOUSES.

Sources of Dampness in Houses.

BY CHARLES F. WINGATE, S.E.

A dry house is, above all things, to be desired. Pure air, pure soil, and pure water are the three requirements for health laid down by Hippocrates, and if these could be provided in modern dwellings, the doctor's visits would be few and far between.

Dampness tends to contaminate the air of houses, the lung food of the occupants, and thus is doubly harmful. A host of diseases, such as consumption, rheumatism, catarrh, and bronchitis, are fostered by dampness of houses. What Frances Power Cobbe aptly terms the "little health of women" is chiefly due to this cause. They spend most of their lives within doors, and to a considerable extent on the lower floors, which are most affected by dampness, and they suffer much in consequence. If our houses could be erected on arches, as suggested by Dr. Richardson, the ills of humanity would be greatly lessened.

When a house is built of stone, the latter should be protected from dampness All stone when new is more or less porous, and until it has become weathered it will absorb a great deal of moisture. An English architect says: "I invariably specify that stonework shall receive, when in a dry state, two coats of a solution, the effect of which is to render the surface of the stone comparatively impermeable, till such a time, at all events, as the stone has had time to weather, and form its own skin and natural protector. In fact, wax and gum are dissolved in a spirit, and the solution is applied with a brush on dry stonework. The spirit volatilizes, and the congealing of the rest forms a skin as thick as the stone is impregnated. Two coats are usually sufficient." Such protection is not so essential in our drier American climate, but in exposed localities, as at sea shores, it may be desirable.

Prof. Reclam, in order to secure healthful houses, recommends: 1. The mortar should not contain much sand, and should be made fresh from day to day. 2. No building with stone and mortar should be carried on in winter. 3. The stones used should never be dipped in water or lavishly soaked, but merely brushed over with a wet brush immediately before laying. 4. Partition walls should be filled up with some thoroughly dry material.

The "saltpetering" of brickwork can generally be prevented by adding linseed or any other oil to the mortar, at the rate of a gallon to the cask of lime If cement is used in the mortar, an additional gallon of oil must be used for each cask of cement. The incrustation, once formed, can be removed by the use of hot water or muriatic acid, but it will reappear by exudation from the interior of the wall, and usually leaves a permanent black or brown stain.

Projecting or "flush" window-sills, though considered æsthetic, absorb the rain through the brick joints, and permit water to drip upon the walls below. They are, therefore, highly objectionable.

An English sanitary authority says that dripping roofs are a very common cause of dampness in the soil in immediate contact with the walls of dwellings. Many a house without a basement floor, and otherwise dry and healthy, is rendered quite unfit for habitation from this cause. It will be frequently observed that the rain falling on the roofs of country mansions is allowed to drip upon and soak into the ground adjacent to their walls, owing to the absence of proper eaves-troughs, downpipes, and water-tight outlets; and if we examine the dwellings in most of our country towns and villages, it will be found that the same condition prevails with them even in a greater degree. It is in the absence of precautionary measures to secure a healthy base to the dwelling that "dry rot," which owes its name rather to the effect produced than to the cause, takes root. This much dreaded enemy is generated in a damp, close, and dark atmosphere; and when once in existence it seems to rise with extraordinary rapidity from its bed, and spread vigorously through timber and walls in all situations, dry or damp, light or dark. One of the requirements of the sanitary code drafted by Mr. Rogers Field, the eminent English engineer, should be adopted by every town. It is as follows: "Every person erecting a new building shall cause all rain water to be so drained or conveyed from the roof of any building as to prevent its dripping on the ground and causing dampness in the walls."

DEFECTIVE ROOFS.

Neglect of roofs is a prime cause of decay in buildings. A writer in the *London Builder* says that "Our roofing, as a rule, is probably in a more primitive condition than any other part of our buildings. If we compare the water-tight and durable protection of the ancient lead roofing to the shelter given by either tiles or slate, we shall see at once how much of the absolute weather-proof efficiency of the building is sacrificed to effect a money saving, which is, of course, a very considerable item. Neither tiles nor slates are laid so as to be absolutely water-tight. They lap over each other, so that in all parts of the roof there is, or ought to be, not less than two thicknesses of slate or an unbroken thickness of tile; and so long as rain falls vertically, or nearly so, it will run from edge to surface of tile after tile, or slate after slate, and make its way to the gutter without entering the roof. But the case is altered if we have anything of such weather as is frequent in more southern latitudes. If a swirling wind accompany a heavy rainfall, it will often carry a stream of water up over a portion of a roof. Snow at times makes its way upward, by the aid of drifting wind, into tiled roofs. Stucco, plaster, and rough cast are highly favorable to the retention of damp and to the progress of decay. Or, again, they may admit of a gentle percolation of water between the wall and its jacket, which has the same effect. The use of bricks made of certain kinds of clay, among which the gault has an evil prominence, is also conducive to damp.

If any repair is required in a roof, and the workmen are allowed to walk over it, unprotected by planks or ladders, the chances are in favor of their making two leaks while they stop one. The mere weight of the man, if allowed to come directly on a tile or slate, will very likely crack it. Again, a nail or peg left out, not to say a pick of a slater's hammer, is quite enough to lead to the sagging of the roof, and to the general increase of damp and advance of decay.

PRECAUTIONS AGAINST DRY ROT.

Besides taking precautions against dampness of foundations and soil, it is important to prevent possible dry rot in the timbers of a house. This may be accomplished by securing a thorough circulation of air around all woodwork, and by coating all the timbers which have to be buried in the earth with coal tar or

some similar substance. In a paper recently read before the Cryptogamic Society of Scotland, by Mr. Young, an architect of Perth, on "Dry Rot Fungus in Houses," he said: "1. Wood is necessary for the first production of the root of the fungus. 2. The wood after a time becomes exhausted of its nourishment for fungus, and when this is the case the plant attached to it dies. 3. Where other conditions are favorable, free ventilation is not against its growth; on the contrary, a draught aids it by dispersing its spores. 4. Upon good, perfectly dry, healthy wood it will not readily take root; but if it gets good root in dampish wood, its growth will ramify over fresh dry wood, and prey upon and destroy its tissues, thus ruining it for structural purposes. 5. The cure is to eradicate it as far as possible by burning the soil, applying a flame to the walls, removing every particle of wood from its locality, and by substituting stone, iron, or cement."

Dr. Wallace remarks: "It is a mistake to suppose, as many do, that dry rot attacks only the wood in the basement story. It is a common occurrence for the ends of joists built into porous stone to become affected by fungous vegetation; and it is frequently seen in pulling down old tenements that the ends of the joists are quite gone, and that for many years, probably, the joists have been resting only on the plaster cornices of the rooms. The remedy is the use of 'shoes' of glazed fire-clay or other material, which are built into the wall, and into which the ends of the joists are placed. The 'shoes' should be somewhat larger than the joists, which should be kept in position by little wedges of wood, so that air can play freely around the end of the joist. Such protected joists will last for hundreds of years, other circumstances being favorable."

Mineral solutions forced into the fibers of wood arrest the decay of timber by impeding decomposition by wet rot, and also prevent the growth of fungi. A weak solution of corrosive sublimate or of nitric acid has been found of service, after which the timber may be painted with white lead and oil. Timber such as wall plates, ground joists, and sleepers near the ground ought always to be creosoted or coated with a solution of coal tar and fish oil mixed with finely powdered clinkers from a forge. If the timber has not been seasoned, the solutions will not enter, the pores being previously occupied by the fermenting juices, and the process, therefore, will not be effectual. Again, if the joists of ground floors are not ventilated, it is of no use to apply remedial measures after the mischief has been done.

A practical method for ventilating the space under flooring is to construct channels under the floor leading to the kitchen chimney flue. These channels should be of porous materials, and should be six feet apart, and, by being carried to the kitchen chimney, the ground air will be drawn off with the heated air and smoke of the chimney. This was accidentally discovered by Dr. Renk, during his experiments at Munich. Being unable to account for the difference of ground air pressure in various parts of the basement upon which he was operating, he excavated the floor, and found that one of the air flues from the chemical laboratory passed under the basement floor to the foul air extract shaft, drawing with it the ground air in its immediate vicinity, thus relieving the pressure upon a certain area.

This arrangement I have found to work very satisfactorily in my own practice; but it is essential to have openings made at different points to admit fresh air from out doors, so as to cause a circulation, otherwise the flue will not draw. Cellars in most country dwellings are damp, and in many cases even wet. They are closely sealed in winter to exclude the cold, often by banking around the windows with stable manure, and rotting vegetables are stored in them until they become sources of danger. Many a typhoid epidemic has been traced to such places. I recently had the great satisfaction of breaking in the windows of an old farmhouse cellar which had not been opened in fifty years, even if they had ever been opened, and the change within, when the air began to circulate, was marvelous to the owners. Every one ought to remember that the cellars should have openings upon opposite sides in order to ventilate them. As this may not always be practicable, and if nothing better can be thought of, I would say, provide an elbow of sheet iron, cut a hole in the cellar ceiling, and carry the pipe through the side wall of the room above, so as to admit air from out doors, thus creating an inward current toward the opposite side of the cellar.—*Herald of Health.*

Sugar in Mortar.

To the Editor of the Scientific American:

On reading your article in December edition on "Sugar in Mortar," I am reminded of a circumstance I had entirely forgotten.

In 1861 my father was having an old country house remodeled. The outside walls required a removal of the plastering. By some means the plasterer had gotten behind with his work, and the painters were at his heels, so to speak, with the last coat of plaster not yet on. Desiring the plaster to dry very quickly, so as not to delay the painters, he mixed some common treacle in the plaster.

Those witnessing it ridiculed the procedure, but the plasterer averred he had frequently done it. It was painted the same day, and now, after twenty-five years, it adheres to the stone walls as firmly as ever.

J. P. H. SERVER.

Lansdale, Pa., December 24, 1886.

Frozen Boards.

A well informed lumberman vouches for the truth of the statement that frozen lumber occupies a smaller space than the best kiln or air dried; that is, that if two boards of the same size be taken green from the saw, one will contract more under the influence of extreme cold than the other will through any artificial drying. An instance of this character is thus stated: A gentleman, now old, remembers how his father determined to lay a floor; but the proprietor of the old-fashioned saw-mill on which the community depended for their lumber had no dry stock—nothing but green logs, which might be supposed to be frozen under the influence of the below-zero weather then prevailing. He was ordered to saw up those logs. The frozen lumber was taken just as it came from the saw, dressed off by hand, as usual in those days, and laid in the floor. Many years after, the son, who was a builder, put up a house for his own use, and built it as well as he knew how. He paid particular attention to the flooring, and himself superintended the kiln-drying of the strips. But in spite of all his care the floors shrank, and in a few years showed wide spaces between the boards. On the contrary, the floor his father laid of frozen lumber, after forty years of service, showed not a crack—a knife blade could not be inserted between the boards, and it had always retained its perfect surface. The story is an interesting one, as showing that woods have peculiarities which are understood by but few.—*Northwestern Lumberman.*

A BLOCK OF SIX CITY HOUSES AT JERSEY CITY N. J.

SIX CITY HOUSES.

Our illustration shows the elevations of six houses now in course of erection at the corner of Jersey Ave. and Eighth St., Jersey City, for Delavan De Long, Esq. The basement and stoops are brownstone, trimmings of terra cotta, stone, and galvanized iron. Each house is 16 ft. 8 in. x 36 ft. Kitchen and dining-room in basement. First floor has front and back parlor; second floor has two bed-rooms, bath-room, and closets; third floor has three bed-rooms and store-room, closets, and light shaft to bath-room. All inside finish with whitewood. The houses show a very fine appearance, all corbels and projections having a beautiful effect, each house being of different design. Cost, complete, of each house with all improvements, $5,000.

EDW. SIMON, *Architect.*

245 Washington St., Jersey City.

Culture of Asparagus.

Mr. Joseph Harris argues, in the *American Agriculturist*, that "the plants which contain comparatively little nitrogen require a 'sap of the soil,' rich, rather than poor, in nitrogen. Turnips contain comparatively little phosphates, and yet soluble phosphates are found of special value as a manure for turnips. Wheat and barley contain comparatively little nitrogen, while clover, peas, and beans contain a high proportion of nitrogen; and yet it is a well known fact that to produce a good crop of wheat or barley, the sap of the soil must be richer in nitrogen than for clover, peas, and beans."

IT is convenient sometimes to mark our tools. This can easily be done as follows: First clean the place you wish to mark, and then cover it with a thin layer of beeswax, raising the edges so as to form a basin. Mark your name in the wax with a sharp instrument, cutting it through to the steel. When this is done, fill the basin with undiluted nitric acid, or aqua fortis, and let it stand a while. The longer it stands, the deeper it will cut. Then wash with water.

DISPENSARY AND RELIEF STATION AT BATTERSEA, LONDON.

This illustration shows the dispensary and relief station in connection with the Wandsworth and Clapham Union at Battersea. Mr. Thomas W. Aldwinckle is the architect.—*Building News.*

What a Western Farmer Saw in the East.

A Western farmer, who lately took a trip East, writes as follows to the *Country Gentleman:*

The first thing to impress me when going from the West to the East is the economy of land in the East. In the West, and even in Illinois, we give everything an abundance of space in which to grow. We often have, for example, the space of a rod between the crop and the fence. If the crop wants to spread itself, we propose to gratify it without straining the fence. The great fertility of our Western land may make this necessary, you know. Our orchard trees are planted wide apart. East they seem to be crowded against the buildings or against the fences. Many more ornamental trees have been planted in Illinois than in New York. Is this because land is so valuable in New York, or because our bare prairies make us love trees the more? But we might well learn of our Eastern brethren in the economy of land.

In one way, however, the Eastern farmers are wasteful of land: they make the fences as crooked as the ways of a politician—to suit some slight conformation of the ground, to avoid passing over a small brook, or what in some cases appeared to me could be only a desire to make the fence as crooked as possible. Now, geometry demonstrates that "a straight line is the shortest distance between two points." It would economize both fence and land to make the fences straight; and the fields would be easier of cultivation. Cross fences, at least, could be straightened. Where the boundaries of farms are crooked lines, why not cut off a rod here and a rod there, and make the boundary line straight? For that matter, while we are speaking of economy in fencing, why not have no fences, as in the West? The old common law was right; a man should fence his own stock in, and not all the world's out; and if this should now prevail, one-fifth of the fencing we now have would answer, and we would not at all be inconvenienced, either.

Shall I offend the pride of my Eastern readers if I say that Illinois has better farm dwellings than New York or Pennsylvania? It is true. Compare the best parts of the States, and we can beat you on houses. But you Easterners beat us on barns; and you beat us further than we beat you on houses. In barns and all outbuildings, you are far ahead of Illinois—of course, further ahead of Nebraska or Kansas. I like to look at the barns in the best part of New York or Pennsylvania, they are so large and substantial and neat. I believe the barns are neater and better kept than the dwellings. Not long since I visited an Illinois farmer who had his own waterworks and gasworks, having water and gas in all parts of his large and very handsome four-story brick and stone dwelling. His barns were large; but they were of boards, had never known paint, and there was litter and manure about them. I could not help but contrast them with the neat Eastern barns, in which I could see the cattle eating. Think of us, or a Nebraskan or a Kansan, putting cattle in a stable in summer! It would pay a Western farmer for the trip to go East and study only barns and stables. He would then realize how much feed he wastes, how much he loses by exposing his animals, and how much manure he might get on his land.

In the West much more farm machinery is used than in the East. It causes a Westerner to laugh to see small grain being cut with a "dropper" or a self-raking reaper; and he cannot refrain from laughing heartily when he sees grain being cut with a cradle. I do not think that one Nebraskan in a thousand would cut grain with a cradle; he would lose the grain first. Nothing short of a self-binder will answer; and then we put on five horses, and cut and bind twenty acres a day. Six years ago I cut 147 acres in one week, and didn't work in the dark or on Sunday either. True, I used ten horses, two sets of five, but that was because the ground was so soft I would mire down if I didn't drive fast, and several times did it anyhow.

We don't cover corn with a hoe. We plant from twenty to thirty acres a day with a self-dropping two-horse planter. We raise the hay on the wagon with horse power (but pile the hay out of doors, sad to say); ride when we plow or harrow, or plant or sow, or reap or bind; and thrash by steam. In great part this is because of our smooth, level land, free from stones and stumps—but in part because we are more enterprising. (Fact.) The Eastern farmers are more wedded to old ways. They look at a dollar longer before they spend it for some improvement, and likely put it back in their pocket when they have finished looking at it. Take the matter of tile draining, for illustration. When Ohio farmers found that it paid to tile-drain, they put down tile liberally. Now the craze has struck Illinois, and Illinois farmers are planting tile as they would corn.

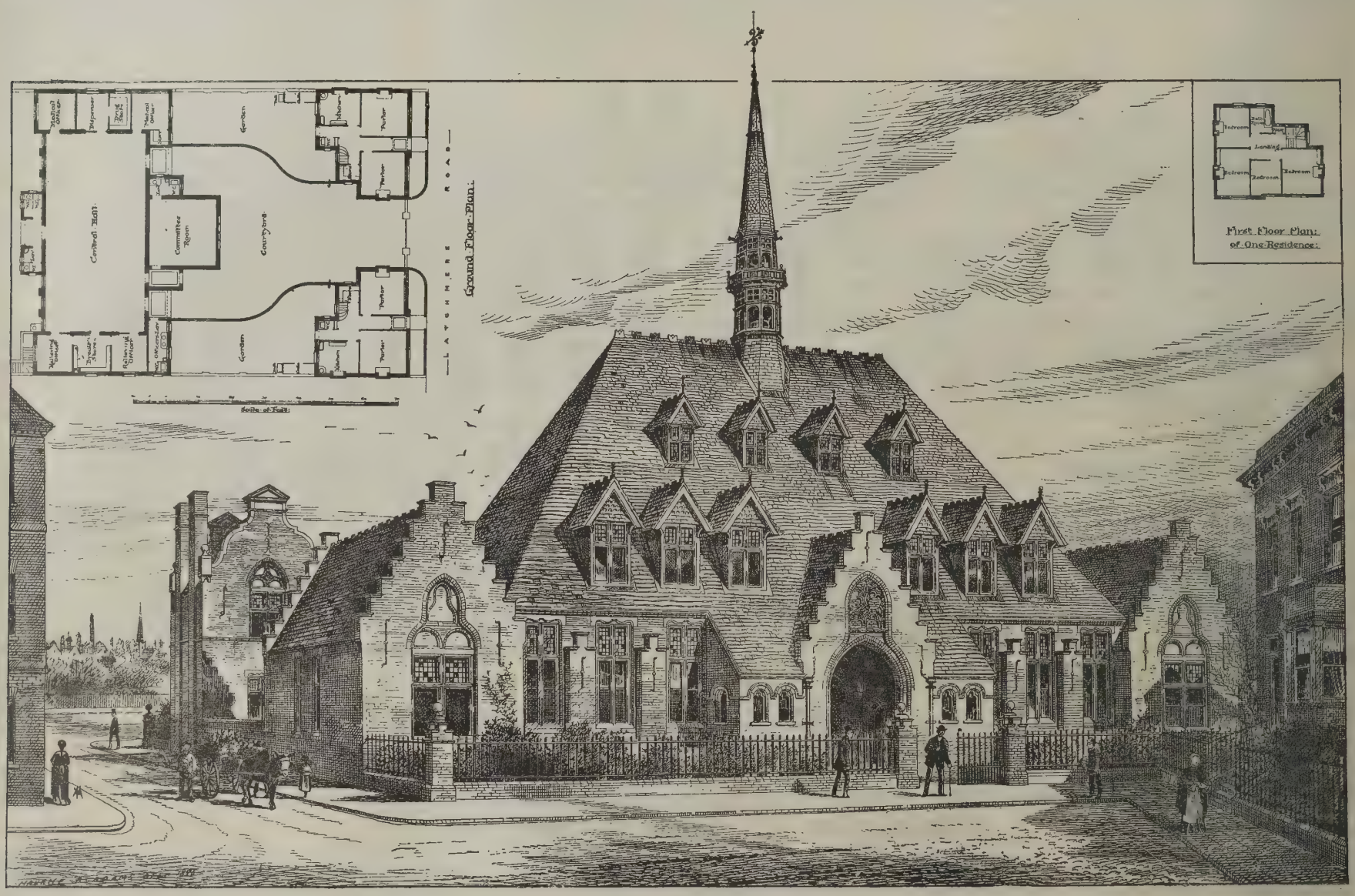
We have found it cheaper to make the wind pump our water than to do it ourselves; and the wind is doing a big lot of work of that sort. Get across the Missouri River, and a well without a wind pump above it is a curiosity. The wind kicks over the traces sometimes, and distributes houses and cattle around in a very annoying manner; but generally it works well and boards itself. My Eastern readers may claim all the credit for Western enterprise by saying that Westerners are emigrants, or descendants of emigrants, from the East. This is about true. The man that pulls up stakes in the East and goes out to Kansas or Nebraska must have considerable enterprise and go-aheaditiveness. And this does more than crop out in his new home—it expands.

I find that a great many Eastern people fancy that we raise mostly scrub cattle in the West. A trip West would change their notion. One of the surprises to me when I made my Eastern trip was that the cattle in New York were no better than the cattle in Illinois. I expected to find them better. Taken as a whole, New York has better dairy cattle than we, though Illinois has as good dairy cattle as any. In beef cattle we are ahead of the East—further ahead than they are of us in dairy cattle. In the West the cattle are not quite so good as in this middle territory; but there the scarcity of cattle is more apparent than the poor quality. And this is true of all stock. Even the ranchmen are now using full-blood males, some ranch owners buying Hereford, or Short-Horn, or Polled-Angus bulls by the hundred. You care for your farm animals far better East than the Westerners do—better than we do. This is not because of our ignorance or cruelty, but because many in the central part, and nearly all in the West, are paying for their land yet, and good barns and stables will come as soon as we can get to them. But observation, and especially conversation with those farmers who get on the trains, convinces me that raising scrubs can be set down against the East rather than against the middle section, or even the West.

We farmers should travel more. The Westerner can learn much of the Easterner, and the Easterner can learn just as much of the Westerner. The Westerner will be impressed that the *forte* of the Easterner is to save; the Easterner will think that the *forte* of the Westerner is to make. If the enterprise of the one could be combined with the economy of the [illegible] would be richer. If the W[illegible] to find every farmer highly intelligent, as I [illegible] be fooled. If the Easterner goes West [illegible] every person ignorant, he will be wo[illegible] State in the Union can show more college graduates to the square inch than Kansas. There is more planting in the moon in the East than in the West, and more coins put away in socks; but in the West we are apt to spread our planting over eighty acres of earth when it should be only forty, and to buy land when we have nothing in our socks but holes.

JOHN M. STAHL.

Quincy, Ill.

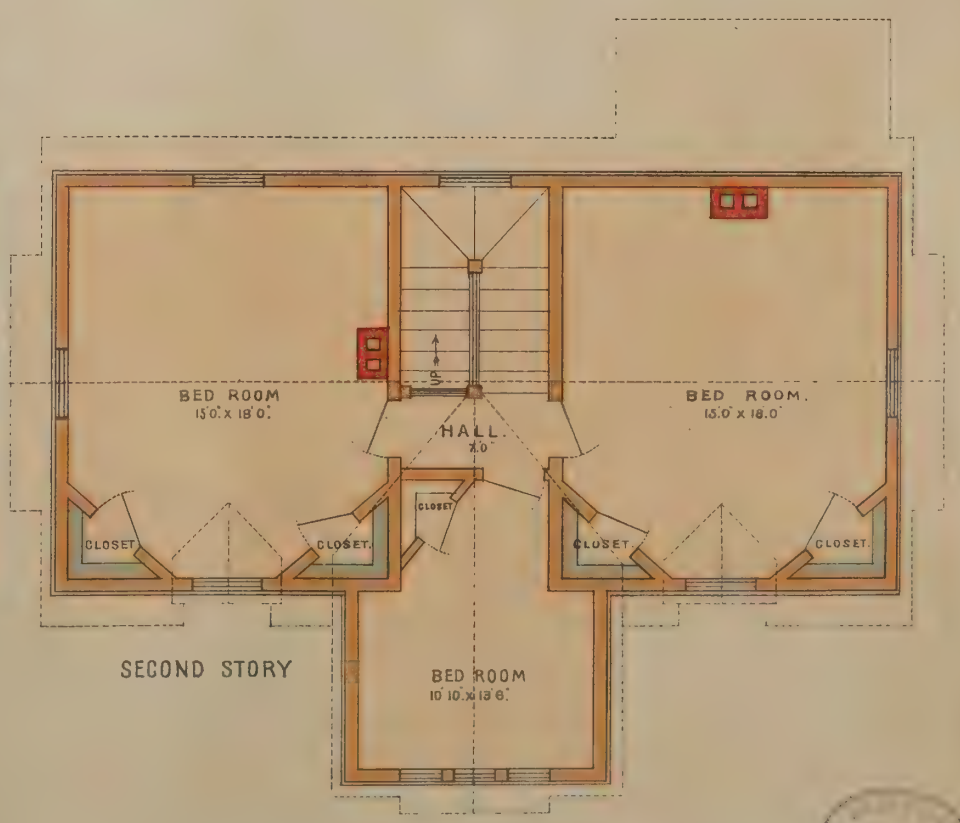


THE BATTERSEA DISPENSARY AND RELIEF STATION.

WIND pressure is generally supposed to increase as the square of the velocity when the opposing surface is at right angles to the direction of the wind, and in such cases Smeaton's rule is to divide the square of the velocity in miles per hour by 200; the quotient is the pressure in pounds per square foot.

THE FARRAGUT CLUB HOUSE, CHICAGO. ROB. RAE, Jr. Architect.

A SIXTEEN HUNDRED DOLLAR COTTAGE. Wm H. BEERS, Architect.



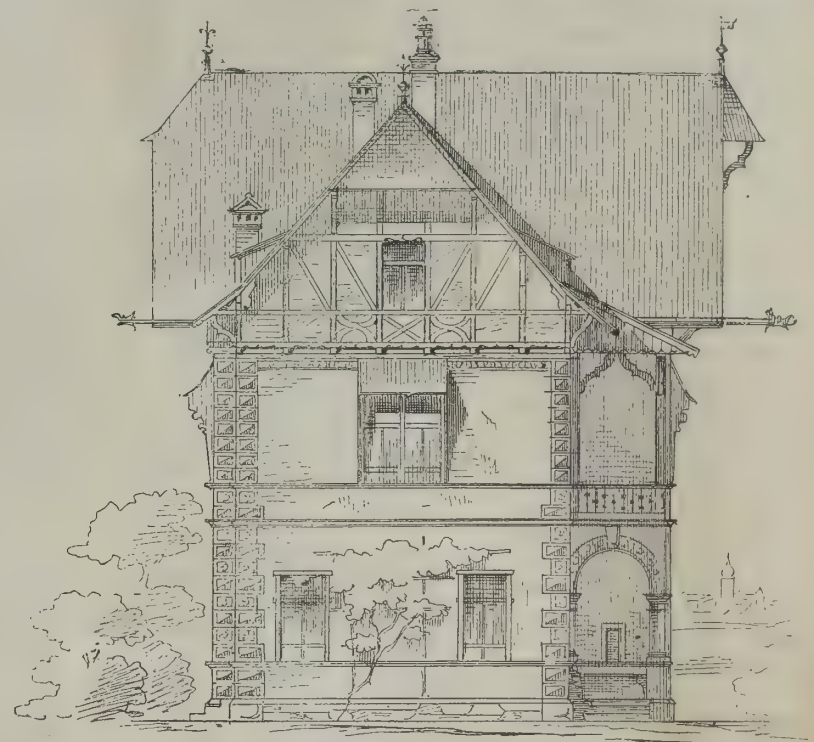
Destruction by Nitro-glycerine Explosions.

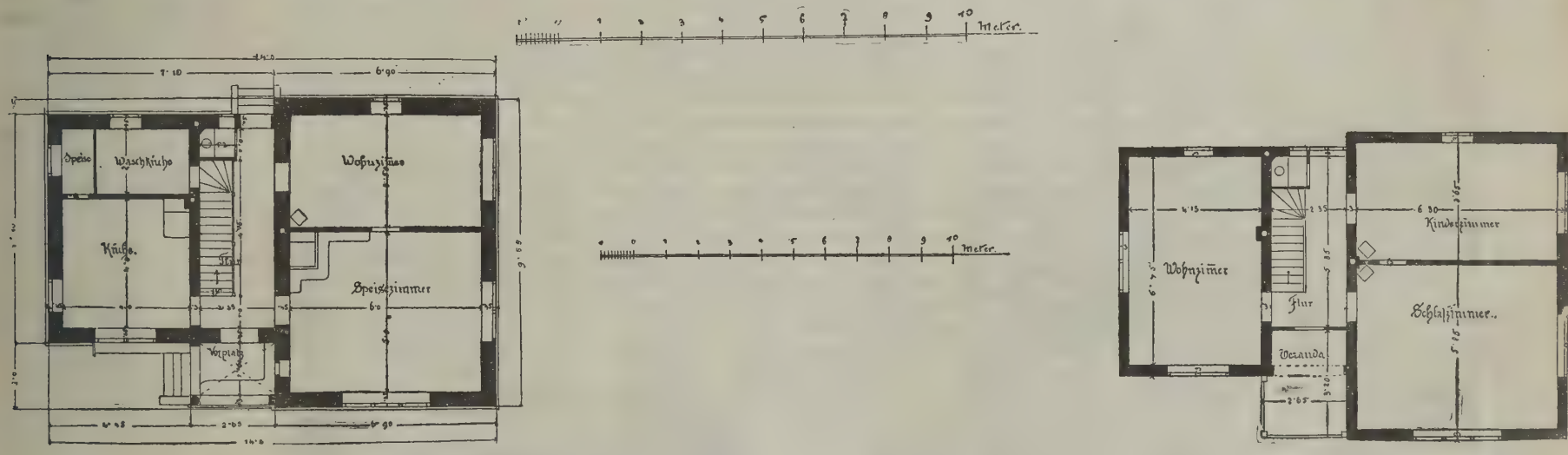
An "old oil operator" in the Bradford oil region thus rehearses in the New York *Times* some facts as to glycerine explosions which are certainly mysterious, and have been observed many times:

"Attending the frightful deaths that so frequently follow the handling of nitro-glycerine in the oil regions, there is one feature the mysterious nature of which is startling. It has puzzled scientific observation and study, and I do not believe to-day that any satisfactory explanation can be given of it. This singular feature is the almost complete annihilation of matter, especially of the human body, which in a majority of cases results from a fatal explosion of this compound. I have noticed that in many instances. I had a teamster in our employ once named Henry France. Like all men of his kind in the oil country, there was nothing either above, below, or on the earth that he feared. He was in the habit of carting nitro-glycerine to any well where I wanted to use it, and he and his partner Warren Jack actually got so reckless in handling the deadly stuff that no other help I had would remain at work when they knew France and Jack were coming in with a load of glycerine. These two men were so callous to fear that they used to unload the stuff as they would a load of bricks, France standing in the wagon and throwing a can to Jack, who stood some feet away, and Jack catching it and placing it on the ground in time to catch the next one his companion tossed him.

"As it takes a [illegible] set of nerves to even [illegible] knows that is nitro-glycerine [illegible] a compound [illegible] will give an [illegible] day in 1880 France was coming in with [illegible] and when he was within a quarter [illegible] we heard an explosion. No one ever knew how it happened, but it was one of the most complete [illegible] nitro-glycerine annihilation I ever saw. We found the usual cellar that a few cans of glycerine always digs in the ground when it goes off, and the usual area of timber felled. Over 300 ft. off in the woods, to the right of the road, we picked up a wagon tire. We found the tail of one horse and the hoof of another. In another part of the woods a man's knee was picked up, and that was all we ever found, except Henry France's greasy cap lying by the side of a stump and his silver watch hanging on the limb of a tree.

"George Doran was blown to pieces by a nitro-glycerine explosion at Red Rock a few years ago. He was a man that weighed 200 pounds. All that the most thorough search ever recovered of that 200 pounds of flesh and bone was a part of one of the poor man's feet—less than one pound. Charles Berridge, a well known oil man, was blown up by nitro-glycerine one winter in Allegheny County. The ground was covered with newly fallen snow. On either side was a high and abrupt hill only a few rods apart. Berridge was a very tall man, and his weight was 180 pounds. The remains of the poor fellow were searched for carefully, but less than 15 pounds of them could be found. The most curious part of the case, and one showing how completely annihilation accompanies an explosion of nitro-glycerine, was this: The greatest force of the explosive is always expended upward. However infinitesimal the atoms to which Berridge's body might have been reduced by this explosion, in falling back upon that spotless snow some trace of them must have been seen, but the snow remained as spotless as before. Besides human bodies, the iron frames of wagons, and even the ponderous nitro-glycerine safes, have been removed from human vision by an explosion as effectually as if they had never been formed, and the mystery of their utter annihilation cannot be explained."





AN AUSTRIAN COUNTRY HOUSE.—BY L. THEYER, ARCHITECT, BOZEN.

The Great Question of the Day.

The late Dr. Samuel D. Gross used the following words in an address delivered at the dedication of the McDowell monument: "Young men of America, listen to the voice of one who has grown old in his profession, and who will probably never address you again, as he utters a parting word of advice. The great question of the day is not this operation or that, not ovariotomy or lithotomy, or hip joint amputation, which have reflected so much glory upon American medicine, but preventive medicine, the hygiene of our persons, our dwellings, our streets—in a word, our surroundings, whatever or wherever they may be, whether in city, town, hamlet, or country; and the establishment of efficient town and State boards of health, through whose agency we shall be more able to prevent the origin and fatal effects of what are known as the zymotic or preventible diseases, which carry so much woe and sorrow into our families, and often sweep like hurricanes over the earth, destroying millions of human lives in an incredibly short time. The day has arrived when the people must be aroused to a deeper and more earnest sense of the people's welfare, and suitable measures adopted for the protection, as well as for the better development, of their physical, moral, and intellectual powers. This is the great problem of the day—the question which you, as representatives of the rising generation of physicians, should urge, in season and out of season, upon the attention of your fellow-citizens; the question which, above and beyond all others, should engage your most serious thoughts and elicit your most earnest co-operation. When this great object shall be attained, when man shall be able to prevent disease, and to reach with little or no suffering his threescore years and ten, so graphically described by the Psalmist, then, and not till then, will the world be a paradise."

Lightning Melts a Lead Water Pipe.

Through the courtesy of Mr. W. F. Stewart, of Hermitage, Pa., we have received an account of the melting by lightning of a lead water pipe on the place of Mr. R. H. Abbey, of Corry, Pa. Water is brought to the buildings from a spring, 80 rods distant, through a lead pipe of half inch bore, at a depth of two feet. Water ceased running about the middle of last May, just after a thunderstorm, and all attempts to force it through failed. In September, Mr. Abbey dug down and found the difficulty to be some 15 rods from the spring, where a section of pipe, 3 or 4 inches long, was found to be melted and fused, so as to be nearly solid. This was cut out and new pipe put in, but still the water failed to run.

Two other melted sections, but not so completely as the first, were found, one about 7 feet above and the other 6 feet below the first. When these had been replaced, a full stream was obtained at the barn. On the west side of the pipe, opposite where it had been melted, the turf had been torn up for a distance of 30 feet or more, and from 1 to 2 feet wide and 6 to 8 inches deep. About 8 feet from the pipe this had forked, one part extending to the middle and the other to the upper fused point. This disturbance had been noticed at the time the water stopped flowing, and "consequently," Mr. Abbey concludes, "when I found the fused pipe, I was satisfied it was the work of lightning."

The New Water Tunnel, Chicago.

The work on the new lake tunnel at Chicago is progressing rapidly. The men work in three shifts, of eight hours each. The first dig the hole about 10 ft. in diameter, through clay, at the rate of about 18 ft. per day, the second trim it up and wall with planks, and the third lay a circular wall of bricks in cement, 12 in. thick. The tunnel is left a shade over 7 ft. in diameter, the whole plastered with cement. This will be completed in about five weeks, and the whole work in about three months.

Hints for Builders.

The architects and builders of a thousand years or more seemed to recognize the peculiar construction of the eye and its ability to take in round objects better than square, and, no matter whether they understood this delusion or optical principle or not, it was apparently applied to all their public buildings and rooms of state. Though some of their specimens of architecture baffle the best engineering skill of the present age, these secrets were not buried beneath the ruins of Baalbec, Herculaneum, or Pompeii.

It may be that the massive stones in some of their large temples were put in place by some mechanical contrivances unknown in modern times; or it may be that large hills once occupied their temple sites, and the stones placed one above another, as we build a cellar wall, and when the structure was completed underground, the hill was razed and the edifice appeared in all its architectural beauty and simplicity, appearing, as it were, in a single night, a masterpiece to excite the wonder and admiration of generations countless centuries afterward.

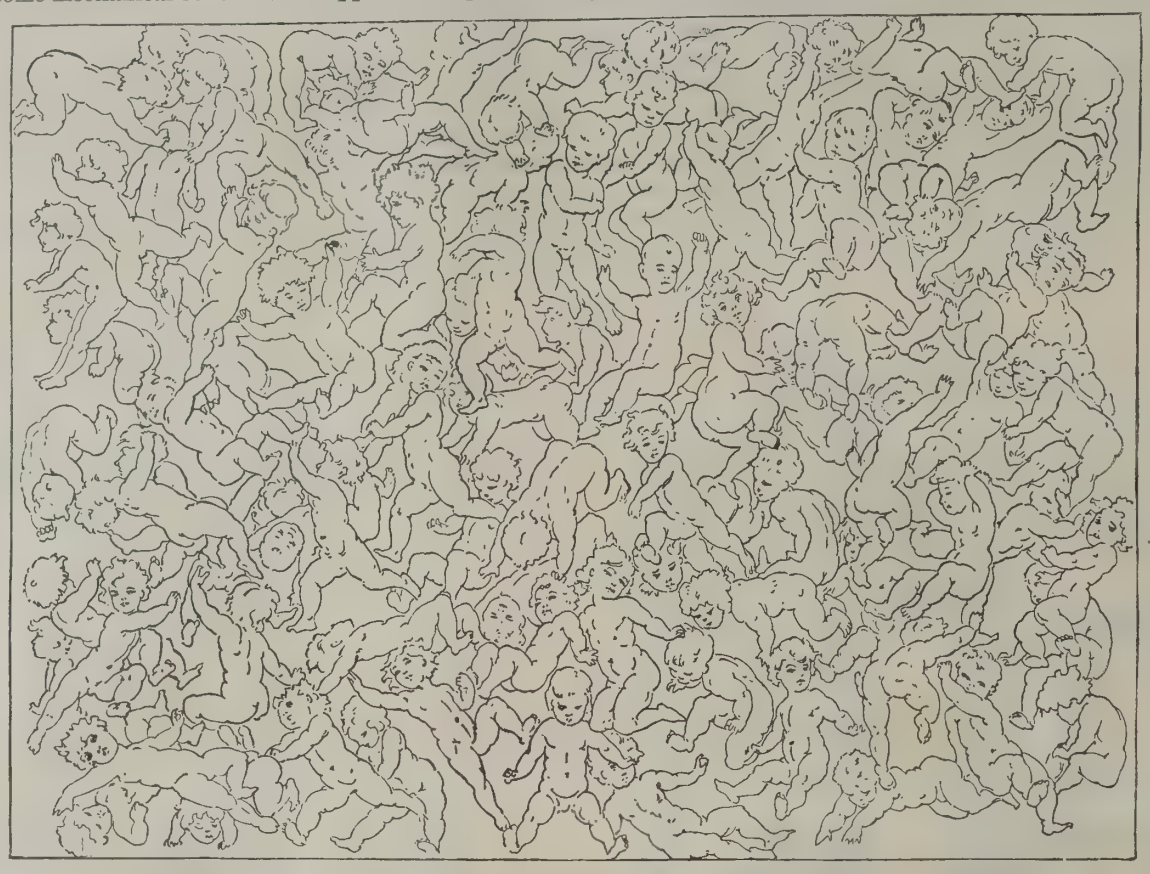
But the external appearances of their structures were by no means the only features that deceived the eye, and were intended to so deceive. The writer has stood in some rooms, in old temples, that the apparent size would stagger belief; and in others very small as measured with the eye would be small and still have so many outside walls, showing them to be very much larger than one would estimate. On the other hand, the large room would not be half so large as it looked to be, and the smaller twice its apparent size. These people disguised distances by curves, domes and alcoves; even a slope of but three inches of the floor toward the center, with a corresponding elevation of the ceiling center, made a difference of as many feet in the apparent height.

These principles are of easy application in modern buildings. To make a room appear higher, the plain surface of the ceiling should be decreased by the mouldings of the cornice, by panels, or, in the absence of these, by bands of color performing the same office. A vertical system of line should be adopted in mural decoration, and the mantel should be lower.

Then, to make a room appear lower, precisely the opposite treatment should be adopted; that is, to increase the plain ceiling, adopt a horizontal system of mural decoration, with a dado and a high mantel. To make a room appear wider may be accomplished by making it appear lower; but where this is undesirable, or where it is insufficient, the effect can be reached by adopting a mural decoration on a graduated scale of form, decreasing upward, so that two or more patterns at the top similar to those at the foot are found to occupy the same space as one at the foot, and this effect can be much increased by a gradation of color upward from dark to light.

To make a room appear narrower is accomplished by making it appear higher; but in case enough deception cannot be produced in this way, the same effect can be obtained by adopting a strongly drawn, large pattern in strong color for mural decoration. To make a room appear longer is accomplished by making it appear lower and narrower, and the effect is increased by decreasing the scale and strength of color of the mural decorations adopted at the ends. To make a room appear shorter is accomplished by making it appear wider and higher, and the same effect can be reached by increasing the scale and strength of color of the mural decorations adopted at the ends.

Any of the foregoing can be modified or increased by treatment of the floor surface, whether by carpets, rugs, painted boards, or the parquet flooring; lines running across a room, or rugs laid down at intervals, having the effect of shortening, and to an extent of heightening and widening a room, consequently lines running in the length increase this dimension, and to an extent reduce the height and width. A floor polished increases the apparent height of an apartment by reflecting all vertical lines and prolonging them.—*J. F. E., St. Louis Miller.*



CURIOUS DESIGN FOR WALL PAPER OR PANEL FOR A NURSERY.

THE CULTURE OF FUCHSIAS.

Lovers of flowers will perhaps be interested in the accompanying engravings, reproduced from photographs representing some fuchsias of unusual forms and dimensions raised by an amateur florist at Evreux. These fuchsias are the ornament of the garden, and are admired by connoisseurs as much for the vigor of their growth as for the abundance and beauty of their flowers. Fig. 1 represents one of these shrubs in its fourth year, and one whose flat, dome-shaped head, two yards in diameter, is large enough to allow several persons to take advantage of its shade. Seated under this plant, one can converse or refresh himself, as is shown by the objects reproduced in the cut, which serve at the same time to well establish the dimensions of this exceptional specimen.

In Fig. 2, three other fuchsias are grouped, the tallest of which is 14 ft. in height. This plant is six years old, and the others four.

It is extremely rare to obtain such specimens of a plant which scarcely exceeds three feet in height in ordinary cultivation. The arrangements represented herewith are very pleasing and decorative, and might be oftener adopted by amateurs in horticulture.

The fuchsia is admirably adapted for the decoration of gardens. The elegance of its form, the lovely aspect of its flowers and their duration, and the little care that its culture requires should contribute to recommend it still further to the attention of landscape gardeners. In 1845, Mr. G. Porcher, president of the Orleans Horticultural Society, published a learned monograph upon fuchsias in an interesting volume which was soon out of print. A second edition of the work appeared in 1848, and to this the author added an enumeration of 738 species and varieties of the plant. We should add that since that period the list has considerably increased, thanks to the science of our horticulturists and to the zeal of amateurs, who are much more numerous than is usually thought.—*La Nature.*

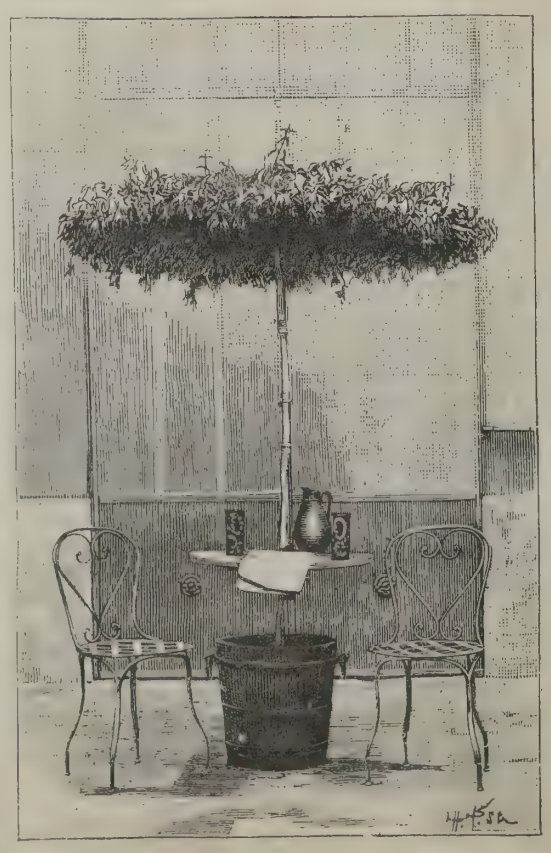
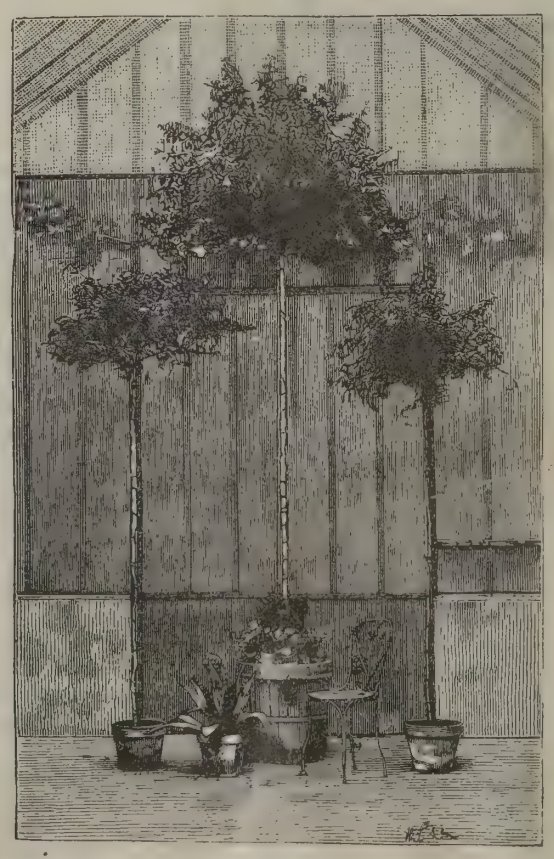


Fig. 1. SHRUBBY FUCHSIAS. Fig. 2.



Ivy in Hanging Baskets.

Among the very best plants for filling wire baskets that are hung up in corridors, verandas, and other exposed places all the year round are some of the many beautiful varieties of ivy, especially those with very small foliage and graceful trailing shoots. Some years ago I was very much pleased with the excellent effect produced by means of the common English ivy alone, that an amateur friend used to employ in a great variety of ways, for decoration, and especially for filling hanging baskets both indoors and out, the windows being draped with elegant shoots from plants growing in the smallest possible root space. Since that time I have employed ivies for baskets, for brackets, and balconies, and with excellent effect. Any one who has not tried them can have little idea of the variety of form and color to be found among these common hardy plants, and the smaller the root space the better do they display their variegation. The golden blotched variety, that only produces a few golden leaves at wide intervals apart when planted in rich soil, becomes beautifully variegated when starved at the root, and some of the silver variegated sorts are equally interesting. The large leaved kind called Hedera maculata, that in rich soil assumes a dull white variegation, is very much improved by basket culture, and the best of such hardy subjects is that they impart a cheerful look to a dwelling house at a time when other less hardy plants need the shelter of heated glass structures. For lining the base of hanging baskets nothing is equal to the stonecrops. They look fresh and green at all times of the year, except when covered with white or yellow flowers.—*J. G., Hants, in The Garden.*

To copper small pieces of sheet iron: Clean the article thoroughly by treatment in a bath of muriatic acid 1 part, water 4 parts, to remove all scale. Wash in hot water and tumble in sawdust wet with a solution of sulphate of copper in water, to which add as much sulphuric acid as is equal to the weight of the dry sulphate of copper. Use about 2 ounces of each to a gallon of water. You may also copper work that cannot be easily tumbled by dipping in the above solution hot. The work must be clean and free from grease.

INITIAL LETTERS.

We give engravings of initial letters, the backgrounds of which are full of the most graceful and artistic forms, which we have thought some of our readers might find instructive and useful in various kinds of decorative work. These forms, or parts of them, may be readily enlarged to suit special requirements. The *Building News*, from which our illustrations are taken, gives the following :

Among the various designs for capital letters employed by the printers at the beginning of the 16th century, a very important position must be assigned to those of the French school, which found some of its foremost and best exponents among the members of the famous family of the Estiennes, perhaps better known to modern readers by their Latinized name of Stephanus. The beautiful interlacing designs used by Iodocus Badius doubtless suggested to the unknown artist who worked for R. Stephanus the motive upon which the decoration of the splendid initial letters employed by him is based. The monogram of the author of these designs is frequently found on the printers' devices and upon many of the woodcuts about this period. It consists of what is termed by heralds a "patriarchal cross," and it occurs beneath the center of the G in the letters we have reproduced, this being, we believe, the only one of the capitals thus distinguished.

May we hazard the conjecture that this was the first letter of the name of the author, and that it is to Geoffroy Tory, who was frequently employed by Stephanus, and who is said to have produced the fine folio device of an olive tree, with its broken and displaced branches, used by this printer, that we owe these charming designs? The mark in question bears a cross of the same kind near the roots of the tree, on the left side of the lower margin of the woodcut.

Very soon after the introduction of engraved initials printed with the type, we find such letters placed upon a background of interlaced ornament, which was at first coarse and rude, as in the work of Ratdolt at Venice in 1477, but which gradually became more graceful and refined in the early years of the 16th century, and reached its perfection in the large alphabet, designed probably for the great Bible issued by Stephanus in 1528, fifteen letters of which form the subject of our illustration.

FRENCH INITIAL LETTERS, 1532-1544.—BY ROBERT STEPHANUS, OF PARIS.

The letters we have selected give all the chief types of the ornament, from the stiff and somewhat heavy curves of the foliage of the L to the evenly distributed and well-balanced tracery of the S. In spite of many diversities of flowers and leafage, there is a strong family resemblance in all this ornament. The frequently repeated dolphin's head from which the principal lines spring in many of the letters, the graceful cornucopia introduced in others, and the five-petaled flower which occurs in most of them, show the same hand throughout. As examples of ornamental treatment, most of these letters furnish quite a study, and will bear looking into most carefully. Among other things we may note the skill with which the masses of light and dark are arranged, all the large surfaces of black in the background being broken up by means of minute dots of white. There is marvelous variety in the motion or framework of all this decoration, and in the admirable manner in which it is disposed. Each woodcut, in fact, constitutes a little picture, and we scarcely know which to select for special praise. Perhaps the S, which is one of the smallest of the letters, has afforded most scope for skillful treatment of the background, and the artist has here well availed himself of his opportunities. The stem springs from one corner of the square, and crosses the S almost at right angles, the chief tendrils shape themselves lovingly into corresponding curves in the top and bottom of the letter, while one of the main branches balances the terminal flower at the summit of the stem. The lines of the foliage and the seven or eight varieties of leaves and flowers are most harmonious. The initials here illustrated occur in the "Virgil" of 1532, and in the letters of Francis I., dated 1544.

G. R. R.

Chimneys.

For those parts of a chimney which are supported throughout, stone may, under some circumstances, be admissible, but brick is always preferable for the purpose. The abutments of a chimney should be tied into the walls by wrought iron bars of sufficient number and strength, turned up and down at the ends, and built into the jambs for several inches on each side. No part of a flue should be of less thickness than half a brick, or 4½ inches. Where slabs of stone or slate are placed level with a floor before the opening of a chimney, they should invariably be laid in sound mortar, cement, or other incombustible and non-conducting substance, and it should be at a distance of not less than 4½ inches from the joists, flooring, or any other woodwork. A chimney built only up to the roof and stopping at that point is always dangerous. Every chimney in a house should be perfectly distinct and separate from every other chimney, from the hearth to the external opening. Chimneys may safely be built in stacks, but they should on no account have any connection within the stacks. Brickwork around flues should not be less than 4½ inches thick in any part. By the Code Napoleon it was not permitted to build a chimney against the wall of an adjoining house without isolating it by an intermediate wall of sufficient thickness to prevent heat passing to the neighboring premises.—*The Architect.*

Preservation of Wood by Lime.

I have for many years been in the habit of preparing home-grown timber of the inferior sorts of fir—Scotch, spruce, and silver—by steeping it in a tank (that is, a hole dug in clay or peat, which was fairly watertight) in a saturated solution of lime. Its effect on the sapwood is to so harden it and fill the pores that it perfectly resists the attacks of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I have a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation. The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution from two to three months, by the end of which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two to three months' steeping is sufficient if the scantlings are cut to the sizes at which they are to be used.—*Field.*

HALF the time spent in fatiguing tramps after wild berries would supply better ones in a fruit garden. They grow well in the shade of trees or fence, and are easily tended and made productive by a liberal supply of cheap mulch.—*Hugh T. Brooks, in Michigan Horticulturist.*

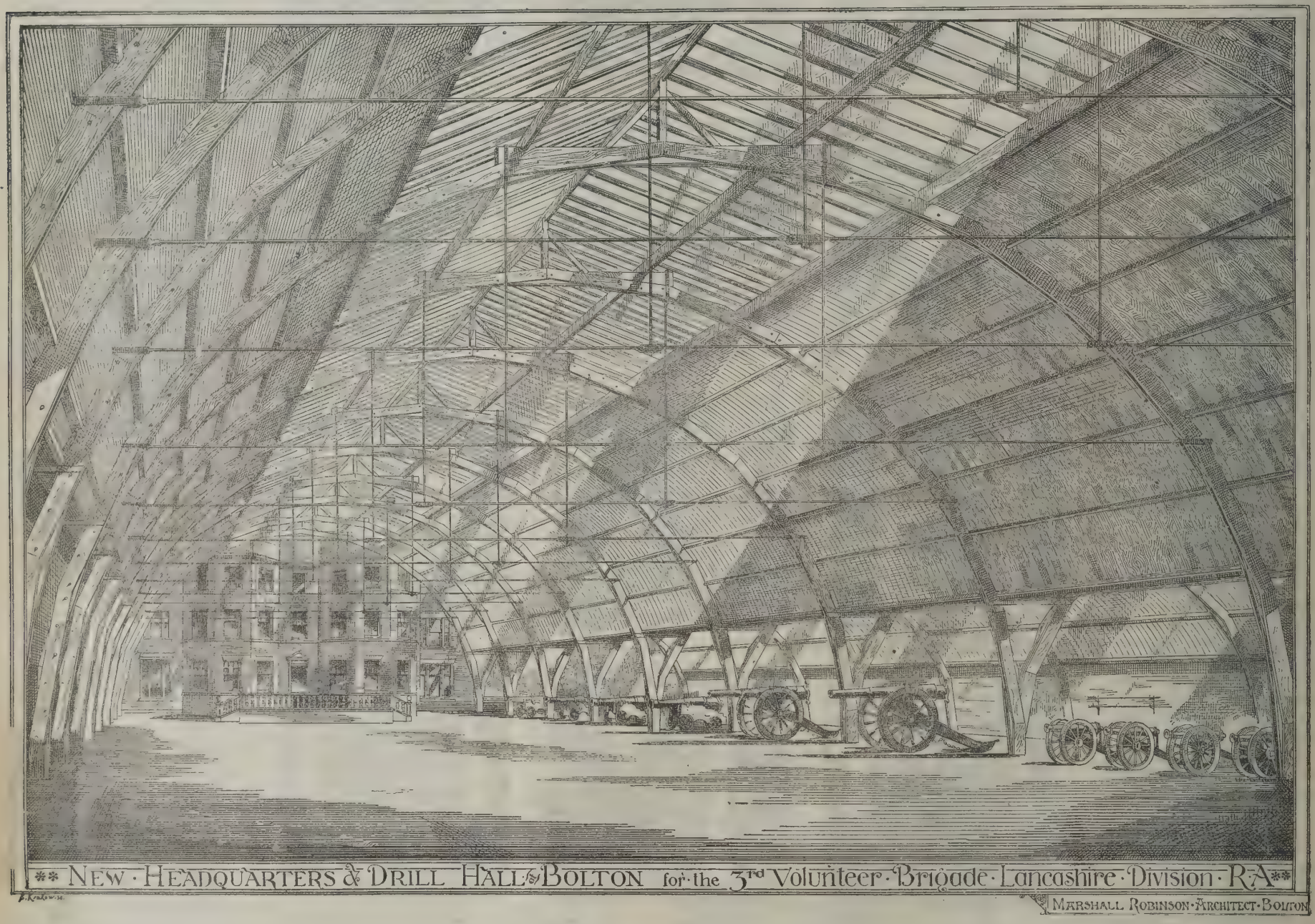
DRILL HALL, BOLTON.

The Bolton Artillery Corps, having for a long time felt the necessity of more capacious premises for drill purposes, have purchased a building in the heart of the town, known as Silverwell House, along with about 2,200 yards of open ground.

The house is exceedingly capacious, and with slight alteration will provide all the accommodation required for a headquarters, including mess and orderly rooms, instructors' quarters, lecture rooms, armory, and clothing stores, canteen, etc. It is proposed to erect upon the ground adjoining the house two large drill sheds, side by side, one 145 ft. by 80 ft. for company drill, and another for gun and gyn drill, 180 ft. by 45 ft.

The general construction of the sheds will consist of semicircular principals, half a diameter high, placed 14 ft. apart, composed of four thicknesses of 11 by 1½ in. planks bolted together, with broken joints. The feet of the principals will be received into cast iron shoes embedded in a foundation of concrete, and kept in position by means of wrought iron tie rods running transversely under ground. Light purlins, 5 ft. apart, will support the roof covering, which consists of slates and boarding. This method of construction gives a permanent building of pleasing form at a very reasonable cost, which, besides doing duty as a drill hall, will be available for mass meetings, bazars, popular concerts, etc. The architect of the structure is Captain M. Robinson, M.S.A., of the corps, and the cost will not exceed £2,000, or $10,000.

The above, from the London *Building News*, is an example of a spacious structure at a moderate cost.



** New Headquarters & Drill Hall, Bolton for the 3rd Volunteer Brigade Lancashire Division R.A.**

Marshall Robinson, Architect, Bolton

Asphalt Pavement.

After a long discussion of the merits of the various kinds of street pavement, a few months ago St. Paul decided to lay asphalt on two or three of its principal residence streets. The opposition to this material was very strong from leading property holders, who feared the effects of the climate, but in the short time it has been laid many who opposed it now pronounce it superior to any other pavement in use, and it is probable that the city will lay it very extensively next year. Mr. J. N. Granger has been one of the leading advocates of this material, and he has taken pains to obtain all existing information in regard to its use under different conditions of use, climate, etc. The following letter was addressed to Mr. Granger, in reply to queries from him, by a gentleman in Buffalo, who is said to be a leading authority on all kinds of roads and pavements, and whose experience extends over a period of thirty years.

First—"Does the noise of horses' feet upon the asphalt pavement become a nuisance to persons living upon the street?" It does not appear to me that horses traveling over asphalt pavement make any more noise than on stone pavements. The passing of the vehicle attached is noiseless, consequently the two together do not make near the noise on asphalt as over stone pavement. Again, the fact that the demand for this pavement is greatly increasing in this city is proof that the noise of horses' feet is not considered a nuisance.

Second—"Is it necessary to repair a pavement so that it will contain blotches?" The asphalt pavement with us can be replaced so that it is impossible to find the repair except upon the closest inspection. This I have seen in several instances. Ordinarily, in passing over it, the repair would not be seen or ever noticed.

Third—"Cannot we tunnel under the pavement so as to make water and sewer connections, without disturbing the surface, etc.?" Yes; I think you can tunnel under it, and that the concrete will hold up under ordinary traffic. I understand that it has been done successfully here. I would state, however, that as the repairs can be done so perfectly, people prefer to cut it out as a cheaper method. With us all connections for gas, sewer, or water are ordered in before any kind of pavement is laid. Water with us is laid at about four feet below the surface; gas about three feet. The sewerage, of course, depends on the character of the undulations and elevation of the street. In some places it may require more depth than in others; of course, always below frost.

Fourth—"Is it not a fact that when men drive up a street paved with asphalt, they will turn on to a side street paved with the same article in preference to turning on to a street paved with something else?" Traffic with us seeks the asphalt pavement, and drivers with heavy loads go blocks out of their way to strike it. This is notably so in a street newly paved with asphalt, in the heart of the city—Ellicotte Street, over which a large amount of traffic is constantly passing. In the upper part of the city the result is the same; there pleasure driving seeks the asphalt pavement, as well as traffic. In regard to width of street pavements, we have them from twenty-eight to sixty feet wide, usually governed by the width of the street. Linwood Avenue is a ninety-nine foot street, and the pavement thirty-eight feet; Delaware Avenue is one hundred feet wide, and the pavement forty-two feet; West Avenue is sixty-six feet wide, and the pavement thirty feet. Sidewalks upon narrower streets (residence streets) are four feet wide. On Linwood Avenue and other like streets they are six feet. This leaves say twenty-one feet for grass plat, six feet for sidewalk, then seven feet to fence or street line. The houses stand back from twenty to thirty feet, with fences removed, making a wide-looking street. Wherever the asphalt has been laid in this city, it is a fact that property on the street has increased in value much more than the cost of the pavement. It is also considered as having much to do in beautifying the streets on which it has been laid. That this city is very much in favor of asphalt pavement is shown by the fact that this season sixteen miles have been laid within the city limits.

The writer says the asphalt is rapidly taking the place of the Medina stone pavement, which has been in general use there for fifty years, and has given satisfaction, and the citizens are almost unanimously in favor of it, and adds:

The oldest asphalt laid here is Franklin Street. This, at the time, was an experiment. It was laid in 1878. Up to this time no repairs have been made or required on it, and, with the exception of surface wear, it is in as good condition as when first laid. When I speak of surface wear, I mean that the center or crown of the street may be worn off, say, from a quarter to half an inch. I will here state that with us all heavy traffic is carted on wagons with the tire four or five inches wide. This is a city ordinance, and all heavy loads are in wagons with that width of tire. This, of course, is for the benefit of all streets.

As to the effect of climatic changes on the asphalt, he says: With us, the climate seems to favor it. How it will stand the extreme heat and cold of St. Paul can, I think, only be determined by experiment, and he refers to the experience of Omaha, which is subject to extremes of heat and cold, as a guide for St. Paul. That this had already been ascertained and proved satisfactory he did not know.

THE BUFFALO CREMATORY.

There has been erected in the city of Buffalo a temple for the incineration of the remains of those whose last wishes in regard to the disposal of their bodies were in favor of cremation, whose æsthetic surroundings please the most difficult taste. The location of the building is in the most beautiful part of the city—about twenty minutes' drive from the city hall, out Buffalo's far-famed Delaware Avenue, and fronting one of the most beautiful cemeteries in the United States (and, therefore, in the world), Forest Lawn. The idea of those interested in its location and construction has been to so arrange all the little details as to render as light as possible the task of the sorrowing one, who is left, not only to mourn the loss of a dear friend, but also to dispose of the remains in a manner least grating to the individual feeling and least harmful to the many.

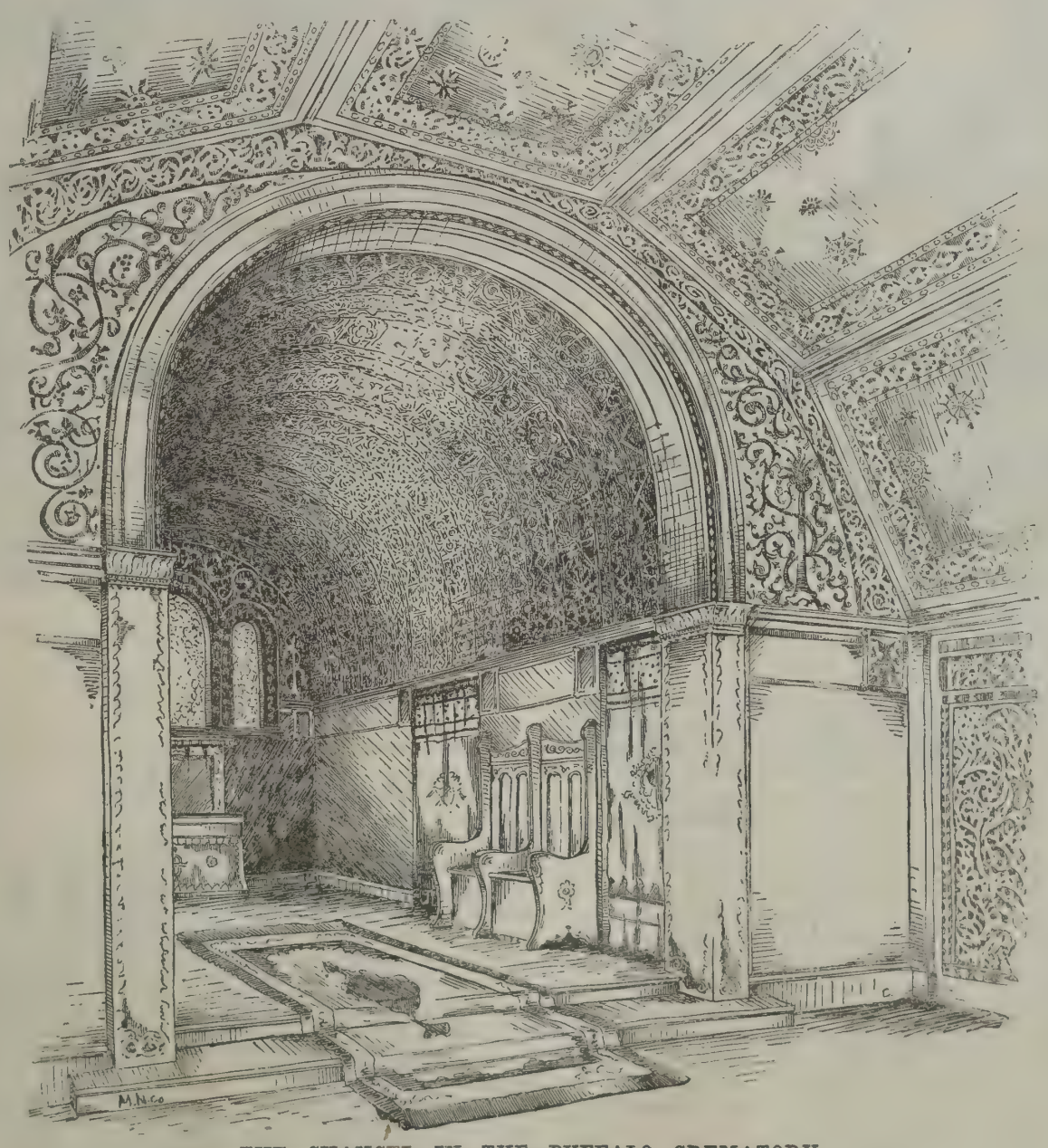
THE BUFFALO CREMATORY.

The crematory is built of dark brown sandstone, in a plain, substantial style, reminding one of the small chapels built in the North Country centuries ago, with square tower and steep, slanting roof, covered with ivy and surrounded by sloping lawns. While the hearse conveys the body to the room where the undertaker removes it from the coffin and places it upon a bier, the relatives and friends enter the chapel, while the clergyman passes behind the organ to take his place in the chancel. The bier rolls noiselessly into the chancel, the organist begins a prelude to a chant, the ceremony takes place according to the desires of the survivors. The surroundings present the ordinary aspect of an earth burial ceremony at a church. The body lies on a handsomely draped bier in the chancel. The chancel is beautifully decorated in an early Italian style. There are twenty-one different symbols and devices interwoven in arches of peacock green and blue, while the windows, of rich stained glass, shed a light, dim and religious. The nave, too, is decorated in the same style. All the surroundings combine to show respect for the dead, while respecting the feelings of the living. The service over, the curtains are withdrawn, and the bier glides noiselessly out of sight of the congregation. The crowd disperses, the incineration takes place privately, and the ashes are taken by the undertaker, to be disposed of as the body would have been, or left to form the nucleus of a columbarium. —*Sanitary News.*

Cleaning Cherry or Ash.

As the proper cleaning and finishing of oak or cherry require considerable care and skill, it will be interesting to notice the practical treatment which the woods undergo under the hands of the wood-worker.

Cherry, as in tables, framing, etc., is usually roughed off by the planing machine and worked into its required shape before finishing. When, as in the case of a veneered door, the frame is ready for cleaning off, it is laid on and firmly fastened to the bench by strips cut in between the joggles, then carefully surfaced or leveled over with the fore-plane. This is in itself a delicate operation, as the surfaces of the pieces must be exactly flush under a straight edge—that is to say, across the face stiles must be on the same level as the face of the rails, and the latter on the same level as the mullions; in short, the surfaces must all be in the same plane and the stiles likewise straightened. All lumps must be reduced, and great caution exercised to avoid sprawling corners. Use the plane with the grain, as the contrary works out holes and causes more trouble with the smoother. This done, it is usual to smooth off with a closely set, well-sharpened plane, or, better still, a Bailey iron plane. Some woodworkers object to using the iron plane, as it marks the stuff, and causes much scraping afterward, but it never breaks corners, and will work well against cross-grained stuff like this. Having finished smoothing, proceed to scrape the surface with a scraper which will cut to a shaving. Work carefully with the grain and take out all holes and rough spots, especially near the joints. When scraping across joints, bend the scraper with the hands and avoid tearing up the grain on either side of the joint. Obliterate every imperfection noticeable before applying the sandpaper, which should be No. 1, and used with a broad, flat cork rubber. On no account sandpaper across the joints, as the grit in the sandpaper will score across the sensitive surface, but work close to the endwood joint, and then with the grain of the jointed stile or rail, as the case may be. Of course the result of the operation depends on the operator's skill, but an exceedingly neat job can be done with a little care.



THE CHANCEL IN THE BUFFALO CREMATORY.

Ash is, perhaps, the most difficult of all the woods to clean, as the grain is of an open and straight nature, varied with a frequently recurring tough cross spot. Like cherry wood, after going through similar treatment, it shows a beautiful surface, which, being filled and varnished or polished, looks rich and glossy, the one dark and warm and the other light and elegant. After sandpapering, rough spots are seen by white blotches, and they can be easily scraped out as before. In these days, when pine is almost obsolete and the hard woods growing in popular favor, it is essential that their treatment be understood.—*Owen B. Maginnis, in Builder and Wood-worker.*

Stained Glass.

An enduring art and an old one is that of the execution of stained glass. Originally an art distinctly identified with religion in its application to churches, it is now equally connected with buildings of every kind. Now, as ever, it constitutes the best form for memorials; best because of its great enduring qualities and best by reason of the charm added as a decoration to the church as a structure, serving to keep alive the memory of the dead or the donor associated with it in a manner which could scarcely be obtained in any other way.

During the past ten years or so, the art has developed in a surprising manner, until now the material is employed in every variety of building with excellent results. Much of the good effect in stained glass will depend upon the artistic merit of the design, and, unfortunately, with the greatly increased use of the material, much of it has been manufactured of a very inferior and inartistic order.

At the same time, it is but fair to say that development of the art has been productive of work from some of our best artists which has reached a standard of merit comparing favorably with, if, indeed, it does not equal, that of past ages, as exemplified in the magnificent examples still found in the European churches, many of them in as good a condition as on the day they were executed.

Foremost among the artists whose efforts in this direction have been so successful is Mr. Louis C. Tiffany, now the President and Art Director of the Tiffany Glass Company, of 333 Fourth Avenue, New York City. This company have executed the designs of some of our finest artists, among whom may be mentioned Maitland Armstrong, Robert Blum, E. W. Longfellow, F. D. Millet, Elihu Vedder, and W. H. Low. Its work is represented by memorial windows and less important work in all parts of the country, and among these may be mentioned that in St. Paul's, Milwaukee, Wis., which is a reproduction of Doré's renowned painting, "Christ before the Prætorium." This window contains nearly 200 life size figures, and is all executed in colored glass alone, the only portions painted being the faces, hands, and feet. The innumerable shades and forms, the folds of drapery, and the numberless shadows are obtained by the use of colored glass of different tones, and the whole work is of rare merit.

The company have executed work in many of the public buildings in the country, such as Columbia, Yale, Princeton, and Williams Colleges; the White House at Washington; the Cotton Exchange, the Seventh Regiment Armory in New York, and in a very large number of private residences and smaller buildings.

Convention of the Western Association of Architects.

The third annual convention of this association was held at Chicago, on Nov. 17, 18, and 19 last, and was well attended. President Dankman Adler, in his practical and carefully considered opening address, offered his congratulations upon the great progress made in architecture generally in this country during the past few years. He said that what might be called a new style—an American style—developed by the wants and conditions of civilization in the 19th century, had arisen, and he urged the members to do all in their power in further developing it. Mr. I. Hodgson read a paper treating of the same subject, and among the other practical papers read may be mentioned "Proportions of Joints and Connections in Framed Structures," by S. G. Artingstall, "The Relation of State Medicine to the Profession of Architecture," by Dr. O. C. De Wolf, and "Hospitals for the Insane," by E. H. Ketchem.

Plants for House Decoration.

During winter, and especially at this season, great numbers of plants are required for house decoration, and no one should object to this use of them, seeing how much they beautify the different sites assigned to them. So much are we accustomed to seeing and admiring well-grown plants in front halls, corridors, dining rooms, drawing rooms, and in other positions, that we really think a house desolate without them; and for this reason, as well as on account of the knowledge that plants thus employed are much more appreciated than those always kept where grown, that we never demur at any reasonable request for decorative flowering or fine foliaged plants. Many are under the impression that a few days' sojourn in a house proves most injurious to plants so employed, and sometimes this is the case, the rubbish heap receiving many that have been ruined, either from the effects of gas, neglect, or too long a stay in a darkened corner. Those who grow the plants, or some one equally experienced, ought also to attend to them when in a house. Overzealous and inexperienced persons are apt to be too free with the watering pot or jug, a daily saturation quickly ruining a plant. Many under-gardeners are also very reckless in this respect, both giving too much and too cold water. Some of the most effective decorative plants have to be taken from plant stoves, and, therefore, when in a cooler atmosphere, they ought to receive less water than usual rather than more of it, and it ought always to be slightly warmed. Even cool house plants require less water than usual in much darkened rooms, where they are often placed, and where they suffer when watered daily almost as badly as stove plants. Not a few stands are water tight, and unless a little judgment is exercised, the plants may soon be standing in water. Our plan is to change most of the plants every Saturday morning, those to be introduced being properly moistened at the roots before they are taken into the house. About three times during the ensuing week all are carefully examined, and if approaching dryness a little water is given. No house or window plant ought to stand in tins or saucers partly filled with water, yet such is too often their lot, and this is bound to soon ruin them beyond recovery. Nor, on the other hand, should they suffer from want of water, though they are more likely to recover from this check than they are from being overwatered.

It is really surprising how long some plants, notably the maiden hair fern, will remain healthy either in a window or in a fairly light position, provided no cold draughts of air or water are given them, and they are carefully watered. Several other Adiantums, notably palmatum, gracillimum, assimile, Capillus veneris (of which magnificum is the best form), mundulum, Lawsonianum, formosum, and Williamsi are very serviceable for house decoration, and will keep fresh for a long time. The same may be said of Pteris serrulata and its various crested forms. P. tremula, Asparagus plumosus scandens, and such Palms as Areca Baueri, Chamærops, Kentia australis, Latania, borbonica, Phœnix dactylifera, and Seaforthia elegans are all good for house decoration, and these and other kinds mentioned are available for those who may only possess a greenhouse or cool conservatory in which to grow them when not required in the house. Pans or pots of Selaginellas are very effective in the house; and I know instances where they are kept near a window all the year round and always look fresh. For this purpose I can recommend S. Kraussiana (denticulata) and its golden and silver forms, Wildenovi and stolonifera. I know a case in which a handsome plant of the Filmy Fern (Todea superba) has been grown in a large pan under a bell glass for six years, and it annually improves. It stands under a stained glass window at the end of the principal staircase, and being frequently watered and never allowed to become very dry overhead, it is always attractive in appearance. Begonias of the Rex type are also good house plants, and everybody must know what a good servant Ficus elastica is. Of greenhouse flowering plants, Arum Lilies prove the most difficult to kill, and under fairly good treatment plants in seven inch pots will flower freely in a window. Cyclamen persicum also thrives and blooms well under similar conditions; but Chinese Primulas are apt to lose color, and present a miserable appearance unless much favored. Cinerarias are not easily kept clean. Cypripedium insigne will last on a table, not far from the light, longer than any other flowering plant, provided always it does not suffer from want of water. Epiphyllum truncatum, or Crab Cactus, as cottagers prefer to term it, will, if not over-watered or overpotted at any time, flower beautifully in a window, and the old Cactus speciosissimus is still a favorite for house decoration.—*W. I., in The Garden.*

AUTUMN FLOWERS.—DRAWN BY JULES LAREE, FROM THE PAINTING BY VICTOR LECLAIRE.—*From Le Monde Illustre.*

Floating bricks are now manufactured in France, the material of which they are composed being a kind of earth found in Tuscany, consisting of 55 parts of sandy earth, 15 of magnesia, 14 of water, 12 alumina, 3 lime, and 1 iron. It exhales a clay-like odor, and, when sprinkled with water, throws out a light, whitish smoke. It is infusible in the fire, and, though it loses about an eighth part of its weight, its bulk is scarcely diminished. Bricks composed of this substance resist water, unite perfectly with lime, are subject to no alteration from the heat or cold, and the baked differ from the unbaked only in the sonorous quality which they acquire from the fire. Their strength is a little inferior to that of common bricks, but much greater in proportion to their weight.

The Story of a Greek Statue.

Visitors to the Louvre of late may have noticed a remarkable little marble statue labeled "A Young Athenian Girl." The story of its discovery and acquisition, just disclosed by the *Temps*, forms a curious page in the history of antiquities. A peasant of Patissia, while digging in the fields, suddenly came across an old statue. Knowing that the Greek law forbids the exportation of ancient objects of art found in the country, and that foreign amateurs are always ready to pay a high price for them, he at once took it home and hid it under a heap of fagots. He then went to the French ambassador, who was well known for his love of such relics, and offered it to him for 12,000 francs. The ambassador repaired secretly to the peasant's dwelling to examine it, and found it was a *bona fide* gem of the fourth century. He telegraphed the discovery to the French minister of fine arts, who authorized him to conclude the bargain. But there was a serious difficulty to overcome, and that was to get it out of the country without being detected by the customs authorities. After some reflection the ambassador instructed the peasant how to set to work. He was to hide [illegible] of vegetables, drive down to a [illegible] where he would find a boat fro[illegible] tioned at the Piræus waiting to [illegible] was performed successfully. The statue, in the midst of the vegetables, was shipped on the boat, and the 12,000 francs were handed to the peasant by the captain as he left the shore. On the arrival of the statue in Paris it was placed in the Louvre, not far from the famous Venus of Milo, while its discoverer, the poor Greek peasant, is now leading the life of a small gentleman farmer on the proceeds.—*Pall Mall Gazette.*

Steaming vs. Fumigating.

A correspondent of *The Garden* directs the attention of plant growers and orchid growers to the advantages of the practice of boiling tobacco juice in houses for the destruction of insects over the old practice of fumigating. One great advantage is that the steam does not scald nor discolor the most tender foliage nor the most delicate flower; that it can be done without previous preparation, *i. e.*, drying the foliage, etc.; and that the operator can walk about in the house if necessary during the operation.

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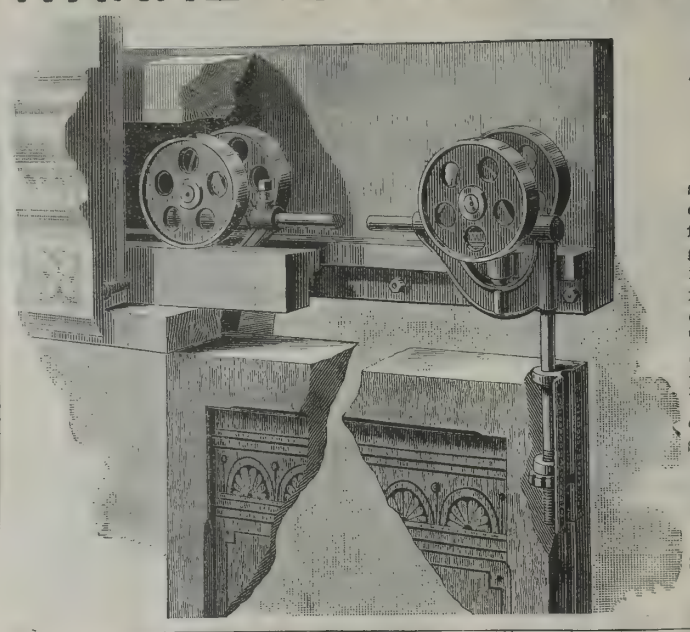

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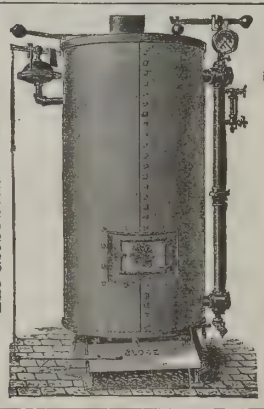

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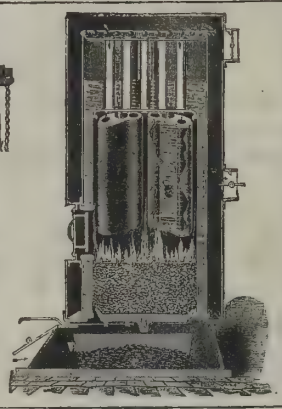

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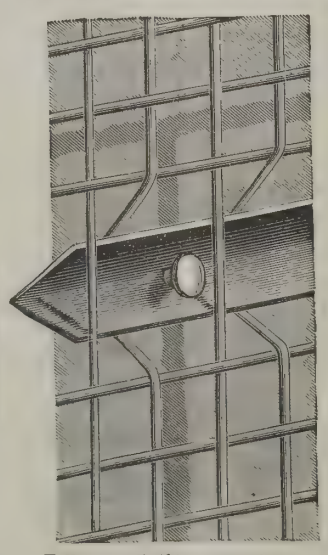

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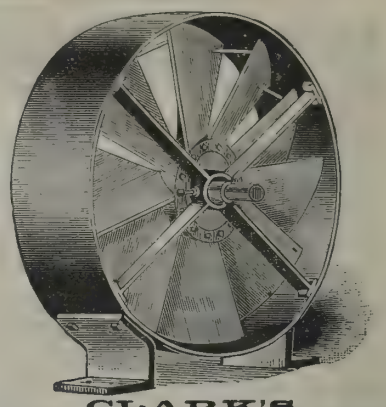

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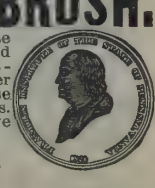

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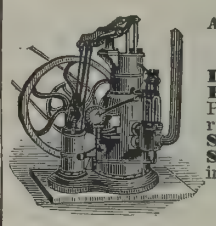

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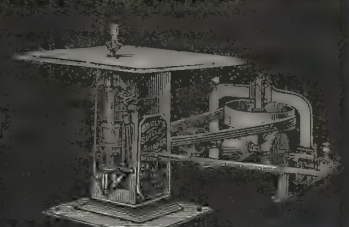

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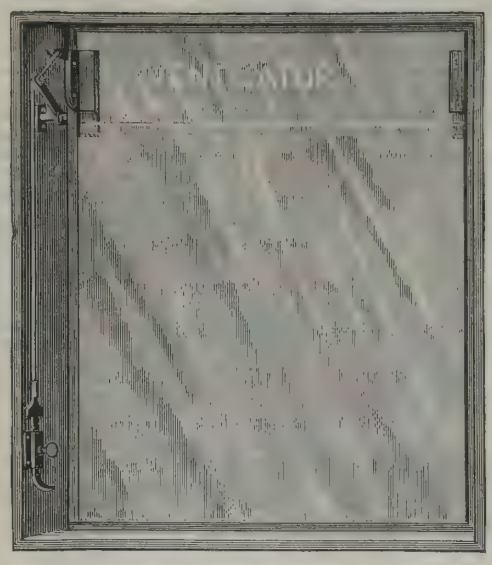

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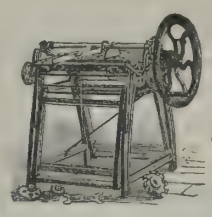

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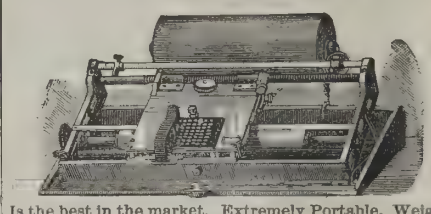

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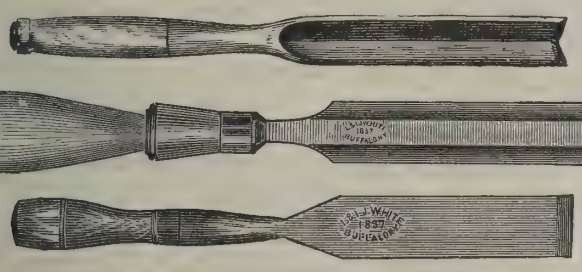

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. B. McN. asks (1) process of frosting glass for church windows? A. Make a saturated solution of alum and apply over the surface of the glass on the inside. If possible, lay the glass flat so that the solution will not run off, and put it in a position to dry slowly. When dry, varnish with any clear varnish. Another method is to dab the surface of the glass with a ball of putty, and then varnish. 2. The best material to put on the inside of a stove flue, to prevent soot adhering? A. Think you cannot prevent the adhesion of soot to pipe unless you discontinue the use of smoky fuel.

(2) F. M. says: Of iron columns, such as are used for building purposes, which are the strongest, circumference and everything else, except quantity of material being equal, the hollow or the solid? Circumference being the same, does not the hollowing of the column weaken it, and is it not done only to save material and probably reduce the weight? A. Hollow columns are not so strong as solid ones of equal length and diameter. The hollow form is used because it is the most economical, giving the greatest strength with the least amount of metal. For instance, the breaking weight of a cast iron column 8 feet long, 5 inches diameter outside and 4 inches inside, is about 154 tons; but if the same amount of metal were employed in making a solid column, its strength would only be about 83·1 tons.

(3) J. B. asks: What is the formula for preparing asphalt street pavement, and its mode of application? Also, is it durable in a cold climate? A. Formula: Grind to powder bituminous limestone, or dry common limestone, or even broken bricks. Take this powder and mix thoroughly in boiling liquid bitumen, four parts of the former to one of the latter. Mode of application: Spread smoothly this mixture with a hot roller; sprinkle over with sand and let it cool. Durability in cold climate: In cold climate it is not durable, being liable to crack under action of frost. In warm climates it does better. Its failure in most cases is doubtless due to the poor or improper materials used, and imperfect preparation of the mixture.

(4) A. T. G. asks what is the process of fastening rubber rolls on clothes wringer. A. Clean shaft thoroughly between the shoulders or washers, where the rubber goes on. 2. Give the shaft a coat of copal varnish, between the shoulders, and let it dry. 3. Give shaft coat of varnish and wind shaft tightly as possible with five ply jute twine at once, while varnish is green, and let it dry for about six hours. 4. Give shaft over the twine a coat of rubber cement, and let it dry for about six hours. 5. Give shaft over the twine a second coat of rubber cement, and let it dry for about six hours. 6. Remove washer on the short end of shaft, also the cogwheel if the shaft has cogs on both ends. 7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft. 8. Clean out the hole or inside of roll with benzine, using a small brush or swab. 9. Put the thimble or pointer on the end of shaft that the washer has been removed from, and give shaft over the twine and thimble another coat of cement, and stand same upright in a vise. 10. Give the inside or hole of roll a coat of cement with a small rod or stick. 11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel. 12. Let roll stand and get dry for two or three days before using same. Cement for use should be so thick that it will run freely; if it gets too thick, thin it with benzine or naphtha.

(5) J. R. S. asks (1) the composition of a cheap paint suitable for rough work. A. Grind powdered charcoal, oxide of iron, or any convenient pigment in linseed oil with sufficient litharge as drier, and thin for use with well boiled linseed oil. You will find it, however, cheaper to purchase a ready made paint from some reputable dealer. 2. A good work on the manufacture of paper from wood. A. See "Technology of Paper Trade," in Scientific American Supplement, Nos. 109, 110, 116, 117, 118, and 123.

(6) S. G. asks: Is there any way to mark white dishes permanently? A. We know of no means except by grinding suitable pigments in proper vehicle, painting the china, and then burning it in.

(7) A. H. W. writes: I want to have twelve triangles made from bar steel, each one to be of a different tone from the other. What sizes should each be, and what sizes of steel should each be made of, to make the best sounds? A. As you cannot depend upon getting steel of small and exact variations in size, your only course is to make a trial of a bar, and make a second trial with a shorter bar for the next note. Then make a trial on the next size steel. Commercial steel varies enough from its normal size to prevent any computation of lengths for chimes or chords or single notes.

(8) W. H. R. asks: 1. How can I construct a simple hygrometer to ascertain the moisture of a room when steam vapor is used? A. You may make a very good hygrometer by hanging a piece of well twisted catgut, that has not been oiled, to a hook with a disk or pointer attached to the lower end just heavy enough to straighten the catgut, using an eye of wire to keep it from swinging. The whole may be fastened to a small strip of wood, to hang upon the wall. The catgut may be a few inches or a foot or two long, according to the amount of twist. The index will swing with the hygrometric changes, and may be adjusted to proportional parts by comparison with a "Mason's hygrometer." Supplements 571, 334, 14, 379, 155. 2. Give me the best recipe you can for a casehardening compound, to be used on open fires. A. Casehardening in the open fire is a very poor and superficial process. We know of nothing better than a mixture of cyanide of potassium and hoof shavings thoroughly pulverized and mixed. 3. What is the best welding compound for working steel? A. There are a great many welding compounds in use, with as many claims to superiority. We have found nothing better than borax with a little sal ammoniac—about 10 per cent—all pulverized together.

(9) M. A. M. writes: I wish to preserve a portion of a polished steel surface and etch or eat away the remainder to a depth sufficient to receive a thick electro plate of silver, so that when plated, and the plating polished, it will be even with the preserved steel surface, so the whole surface will be even, but a portion steel and a portion silver plated. A. This is what is called electro inlaying, and is only successfully practiced by experts in this style of art. The etching process is the same as for engraving steel plates. The protecting material is asphalt varnish, which may be used with pencil brushes for ornamental work or for stopping off any parts not required to be acted upon by the acid. Asphalt, resin, and beeswax about equal parts, varied for hardness to suit the temperature, is suitable to cover the surface, warmed by dabbing with a small pad. This allows of the figure being scratched in with a point. Nitric acid 1 part, water 2 to 4 parts, is generally used for biting in the figures. This, followed by a dilute muriatic acid dip for removing oxide and cleaning the surface, will probably prepare the piece for electro plating. If not, you will have to make a study of chemicals that will clear the surface so as to take the silver; possibly a few trials cyanide of silver or potasso-cyanide may give you success. For electroplating, see details in Supplement, No. 310.

(10) B. F. R. asks: Can you add any harmless substance to milk that would make a copious and permanent foam on being beaten with an egg beater? A. You might take the following, which is used with soda water: To each gallon add from two to four ounces of gum arabic dissolved in its own weight of water; or use the following: Quillaya bark 4 ounces, alcohol 4 ounces, glycerine 4 ounces, and water 8 ounces. Exhaust by percolation to make 1 pint of tincture. Two to five drachms of this tincture to be used to every gallon of fluid.

(11) J. W.—Holes in glass plate or windows may be cut with a diamond by making a disk of wood and using it as a guide to the diamond. It requires a delicate touch to make the first cut so a crack will not start outwardly therefrom; but when properly cut, so that the crack can be seen all around the circle, the glass can be gently tapped with a small piece of wood directly under the cut, when the fracture will run through the glass, and follow the tapping all around the circle. When the separation is complete, the center may be gently pushed out. If it should appear to be interlocked or dovetailed, a few cuts across the center will enable you to take it out in pieces.

(12) A. S. asks what to line a wooden tank with, which will withstand the action of nitric and sulphuric acids. A. Cover the inside with paraffine; go over the inside with a sadiron heated to the temperature used in ironing clothes. Melt the paraffine under the iron so as to drive it into the wood as much as possible, then with a cooler iron melt on a coat thick enough to completely cover the wood.

(13) O. F. B. desires (1) recipe for making stove blacking. A. Take of black lead pulverized 1 pound, turpentine 1 gill, water 1 gill, sugar 1 ounce. 2. A recipe for cleaning isinglass. A. Micas may be cleaned by taking them out and thoroughly washing with vinegar, a little diluted. If the black does not come off at once, let it soak a little.

(14) W. P. J. asks why a loose pulley of certain size, or a wheel such as is used on a band saw machine, shakes when running a certain speed, whereas if the speed is decreased or increased the vibration ceases. A. The cause is the synchronism between the time of revolution of the wheel and the vibration of the band saw. At the speed in which they correspond, the vibration of the band is increased. This phenomenon often takes place with belting, sometimes extending to the floors and the building. We know of a case where at a certain speed of the engine the walls of a building shake.

(15) B. A. H. asks (1) directions for making wax moulds for moulding plaster centers for ceilings. A. Plaster centers are moulded in plaster moulds, oiled with linseed oil. In making an original design, you may use beeswax and whiting melted with a few drops of oil to soften, so that it may be worked. Clay is also used for designing patterns; oil the clay pattern before pouring on the plaster of Paris. 2. What thickness would a cast iron box 6 inches by 6 inches inside have to be made to hold 330° of steam heat? A. 330° heat in steam is equivalent to 90 pounds pressure; your box, if a cube, should have the inside corners rounded, and be about ¾ inch thick for safety.

(16) W. M. S. desires a recipe for a quick drying varnish. A. Use the following: Pulverize 1 ounce sandarac, ¼ ounce mastic, ¼ ounce elemi, dissolving them in ⅛ ounce Venice turpentine, and adding to it a solution of 4 ounces shellac and 3 ounces oil of lavender in 12 ounces alcohol.

(17) N. A. H. asks: Why does placing a vessel of water on a stove in a close room prevent a headache or feeling of closeness in the room? A. Any beneficial effect from placing a vessel of water on a stove is due to the imparting of moisture to the air.

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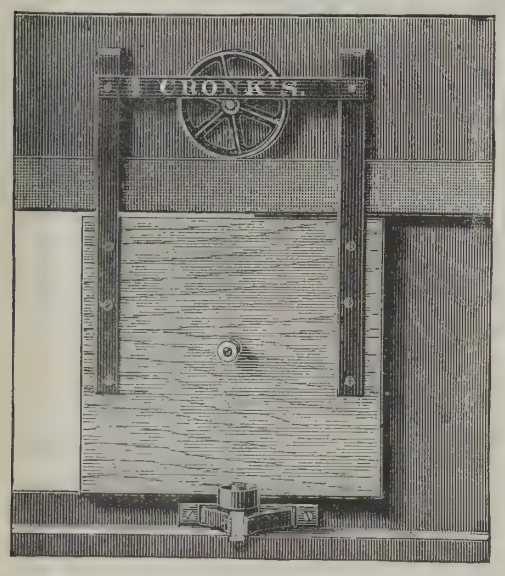

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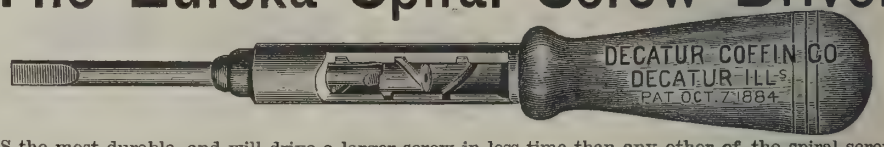

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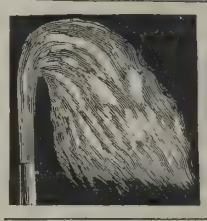

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S. S. Bent & Son v
The Henry Dibblee Co viii

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Alfred Godwin viii
Tiffany Glass Co viii
Redding, Baird & Co ..... cover ii

Stained Glass Substitute.
W. C. Young ..... cover iii

Steam Boilers.
Peter Devine ii

Stone Filters.
Gate City Stone Filter Co ..... cover ii

Steam Heating.
John Davis & Co viii
Eureka Steam Heating Co viii
Globe Steam Heater Co iv
Gloucester Iron Works ii
J. Reynolds & Son vii

Steam and Vacuum Gauges.
Vulcan Works ..... cover iv

Terra Cotta Lumber.
International Terra Cotta Lumber Co v

Tiles.
The Henry Dibblee Co viii

Tracing Cloth, Drawing Paper, Etc.
Frost & Adams ii

Tools and Foot Power Machinery.
C. E. Little i
Millers Falls Co ..... cover iii
Seneca Falls Mfg. Co iv
Yerkes & Plumb ..... cover iv

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Thos. W. Jones i

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The Am. Writing Machine Co iv
Hall Type Writer Co v
Wyckoff, Seamans & Benedict ii

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Gloucester Iron Works ii
Pancoast & Rogers ii
Vulcan Works ..... cover iv

Varnish.
F. W. Devoe & Co vii
Wm. T. Lindeman & Co iii
Standard Varnish Works viii

Ventilating and Exhaust Fans.
Geo. P. Clark iv

Ventilators.
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Violin Outfits.
C. W. Story ii

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Pancoast & Rogers ii

Water Purification.
Wainwright Mfg. Co ..... cover iii

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J. Dunfee & Co viii
Ayers Patent Sash Holder Co iii
Richmond Weather Strip Co iii

Weather Vanes.
Thos. W. Jones i

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J. P. Tolman & Co ..... cover ii

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J. A. Roebling's Sons ii
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D. Rosenberg & Sons viii

Wood Water Pipe.
A. Wyckoff & Son iii

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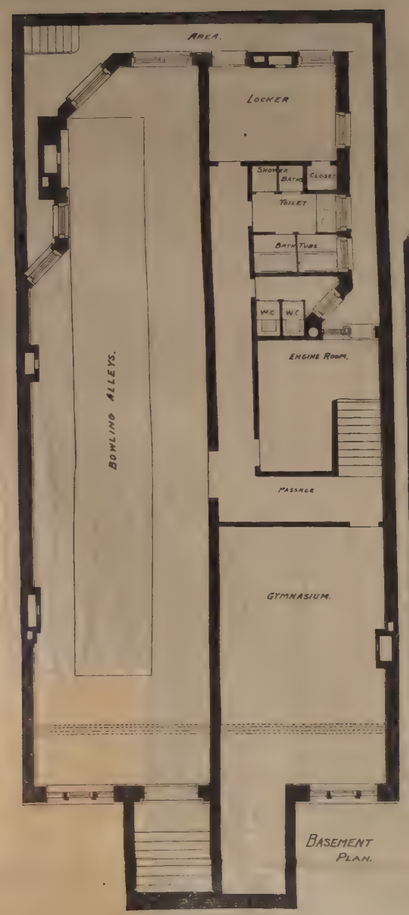
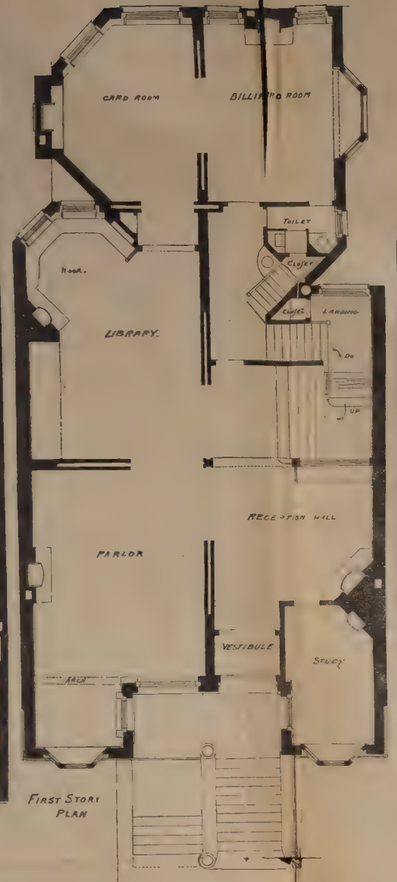
Battle Creek Machinery Co v
Connell & Dengler vii
E. & F. Gleason ii
J. S. Graham & Co vii
Hoyt & Bro i

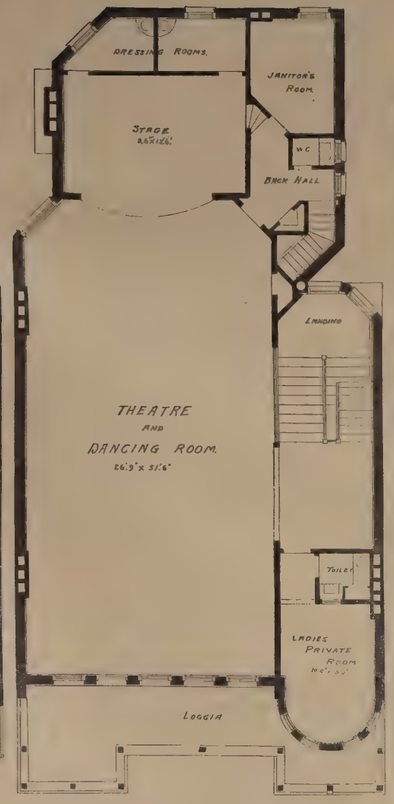
Wrenches.
Utility Wrench Co i



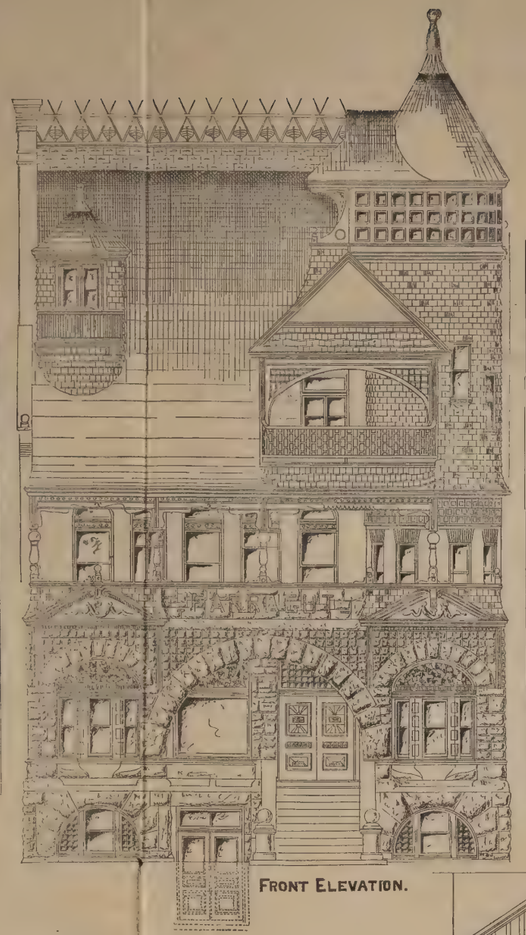
Basement Plan.



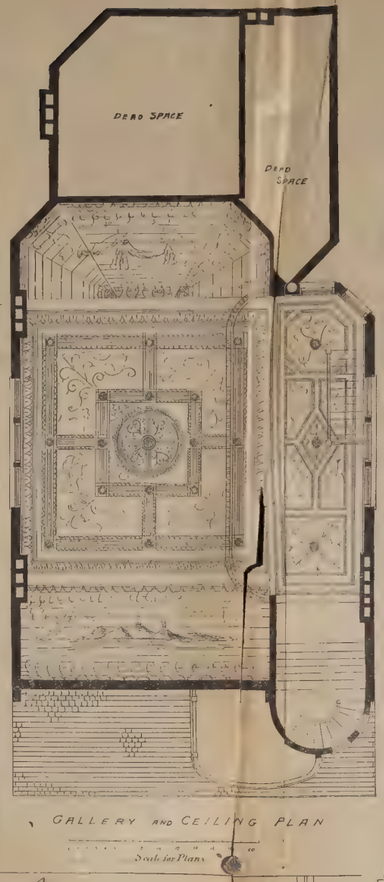
First Story Plan



Second Story Plan

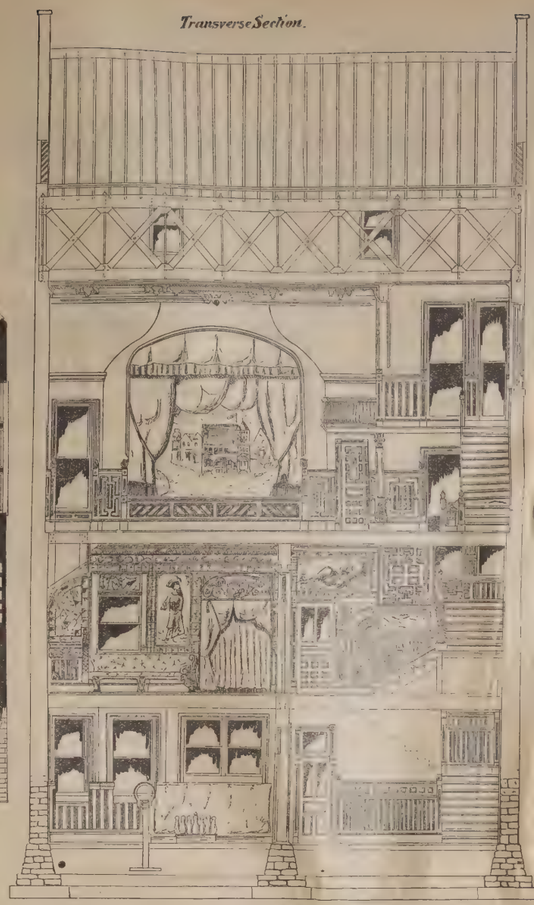


Front Elevation.

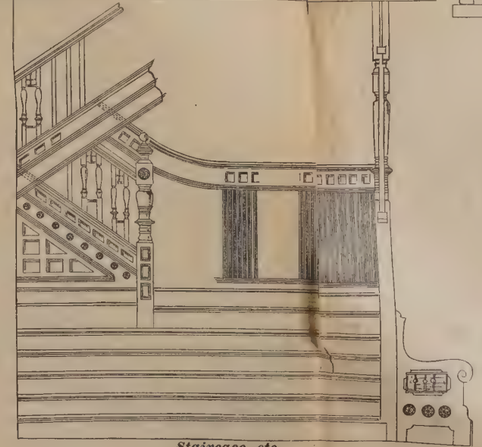


Gallery and Ceiling Plan

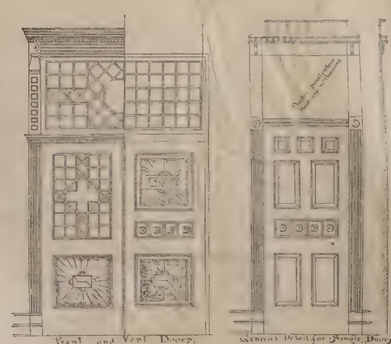
Scale for Plans



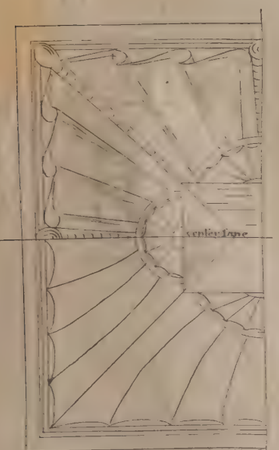
Scale for Elevation & Section.



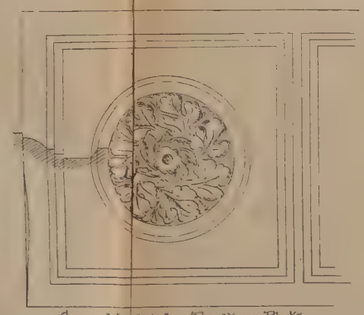
Staircase, etc.



Front and Vest. Doors. General Detail for Single Doors



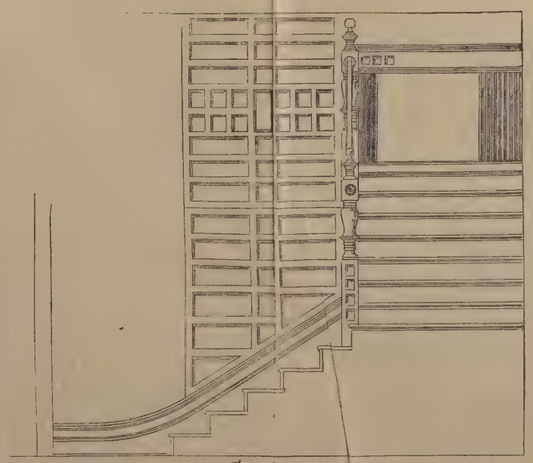
One-half of Full Size of Front and Vestibule door panels



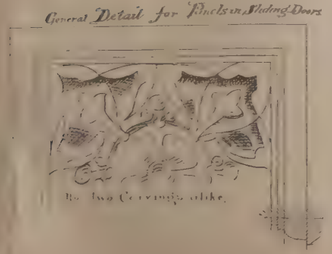
General Detail for Rosettes in Blocks

Scale for Details.

Details of Stairs etc.

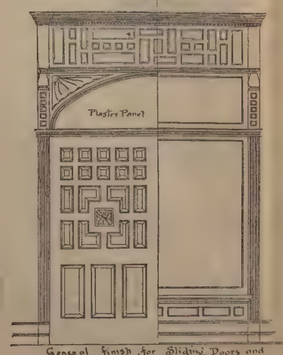


Staircase etc

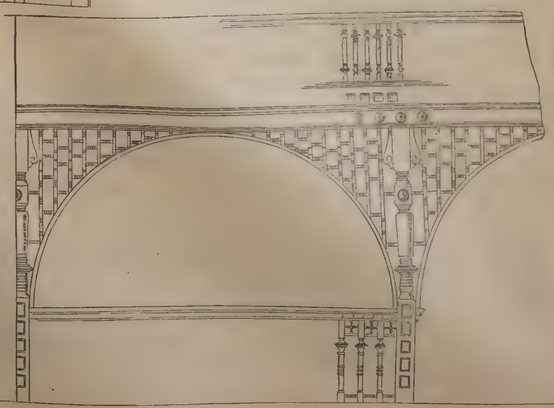


General Detail for Finish on Sliding Doors

Both Doors alike.



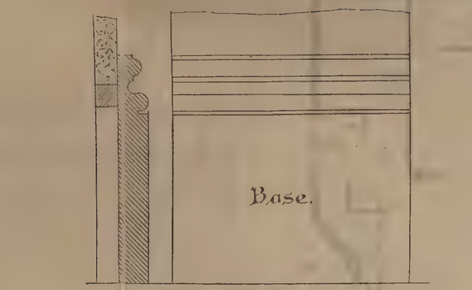
General finish for Sliding Doors and Windows 1st Story.

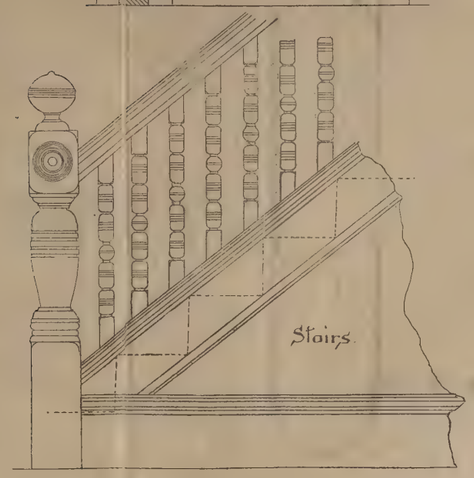


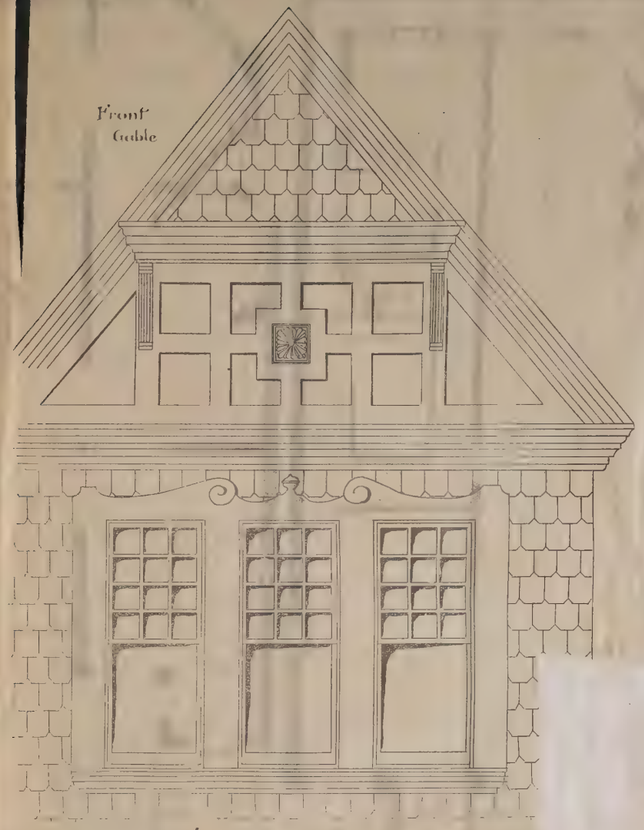
Details of
Farragut Club House,
Chicago, Ill.

Robert Rae, Jr., Architect,
97 Clark Street, Chicago.

Front Elevation.



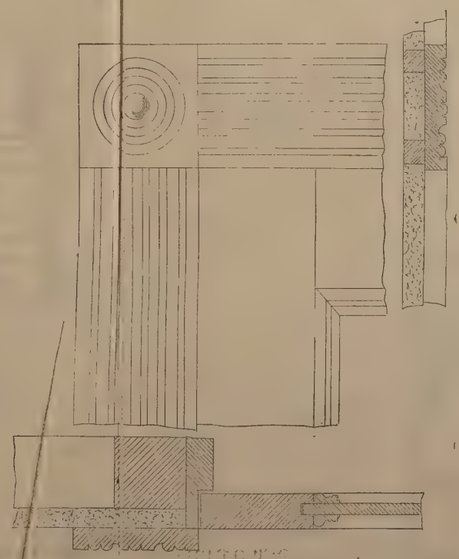




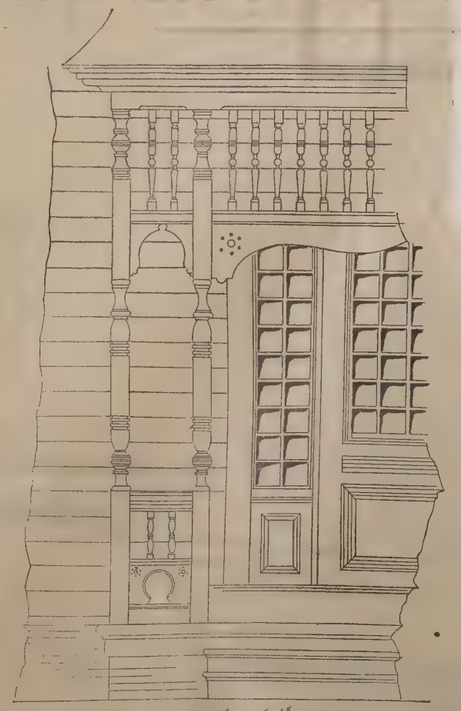
Details of Cottage at Babylon, N.Y.

William H. Beers, Architect,
Tribune Building, New York City.

Side Elevation.



Door Trim.



Porch Detail.

Scale for Details.

Details to accompany Colored Plates. For description see Architects and Builders Edition of Scientific American for February, 1887.

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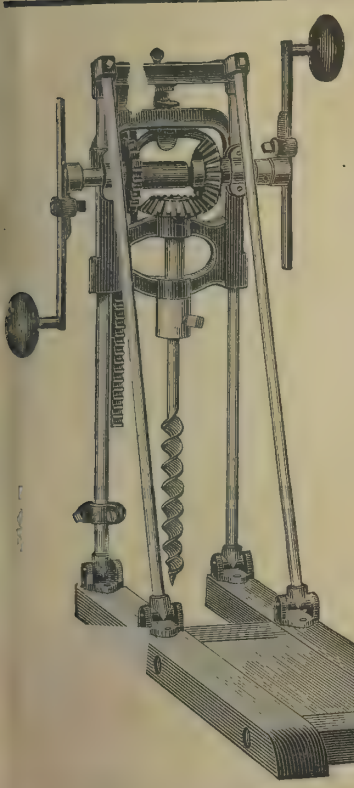

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When the Auger is drawn from the hole, the frame hangs itself up until the machine is moved to the next hole, then it is dropped down by turning the crank back until the Auger strikes the wood, when it is thrown out of gear and proceeds to bore the next hole. As seen in the cut, the machine has adjustable cranks, which fully regulate its speed and power

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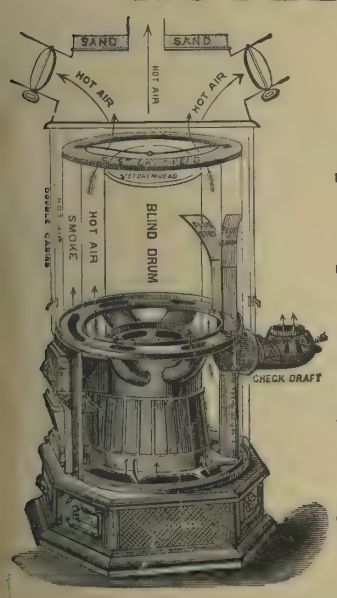

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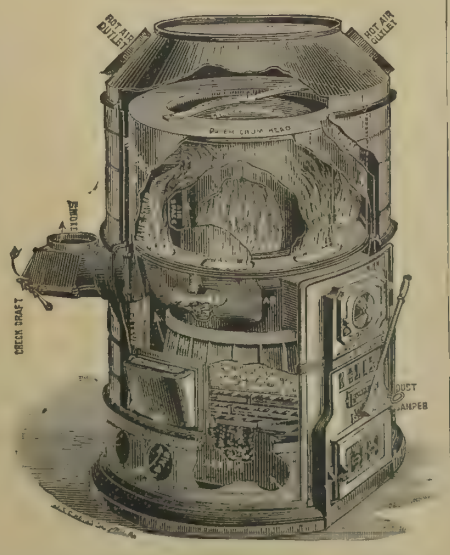

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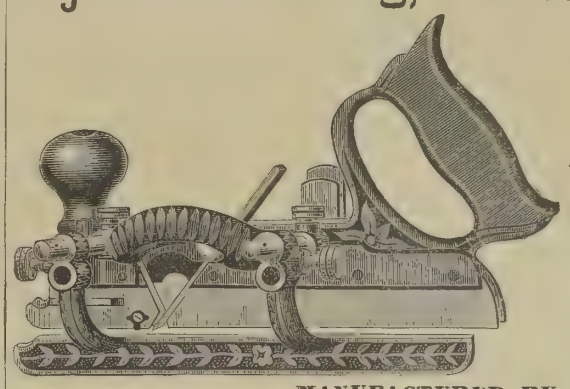

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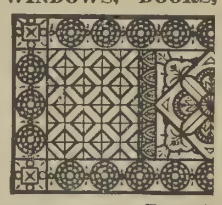

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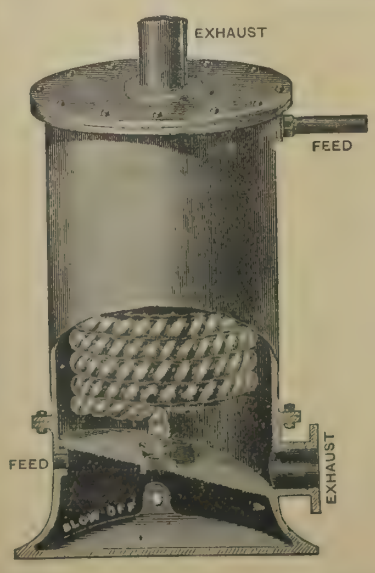

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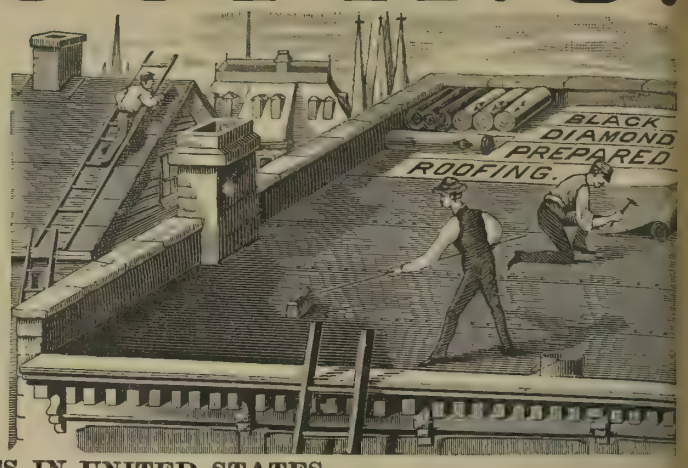

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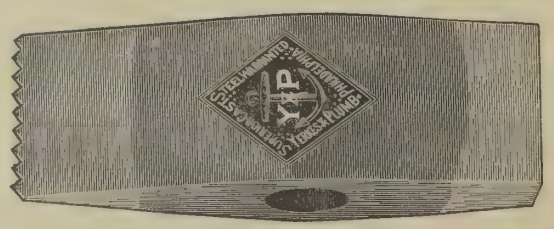

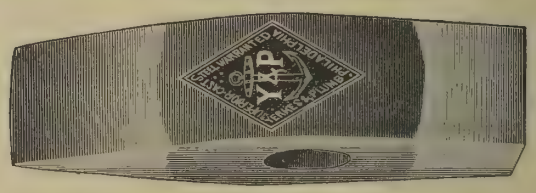

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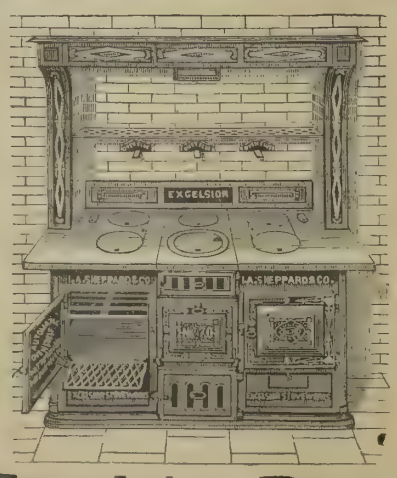

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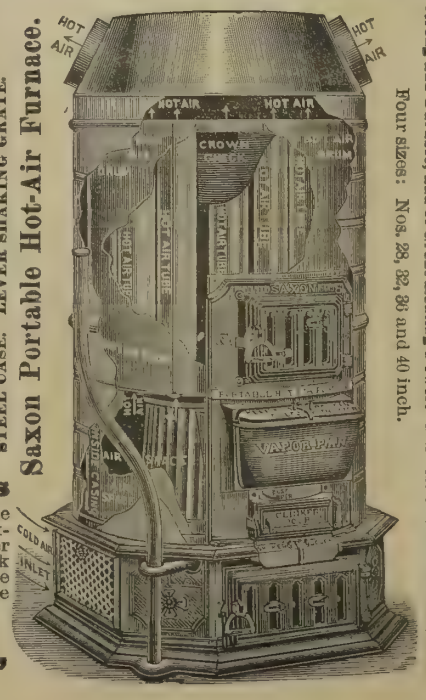

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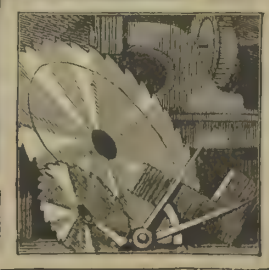

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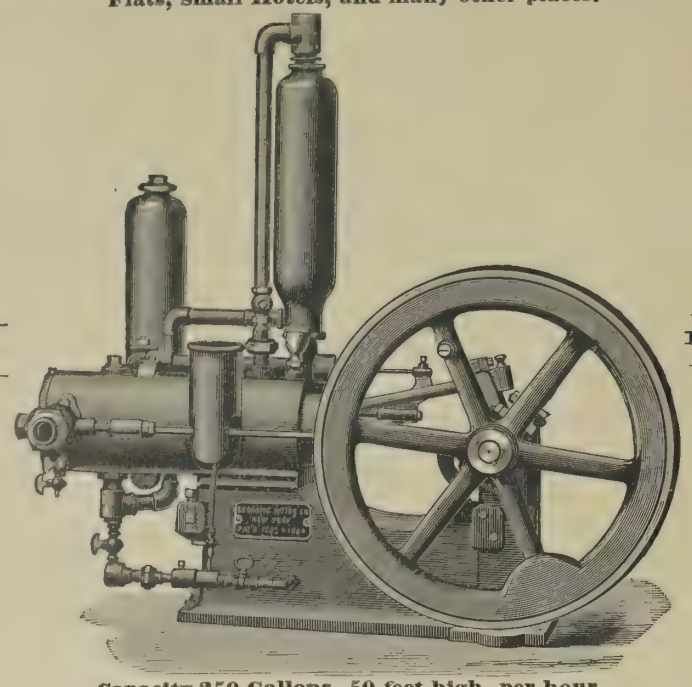

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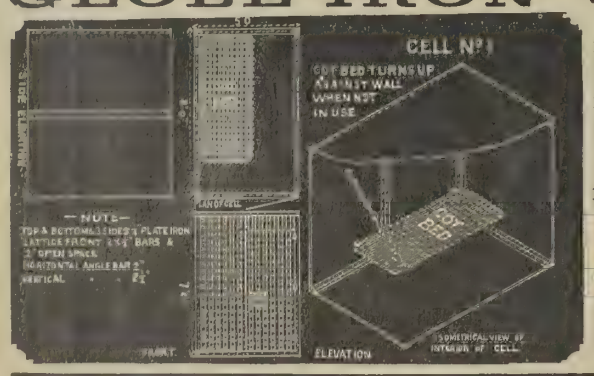

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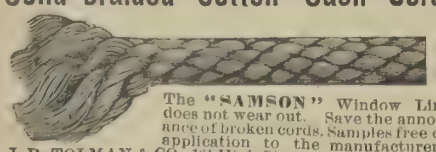

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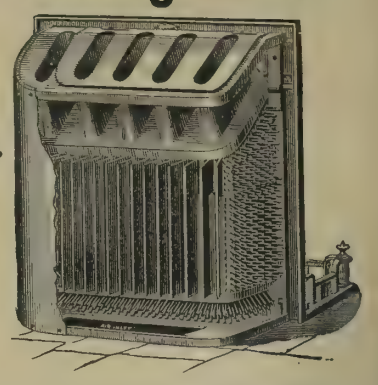

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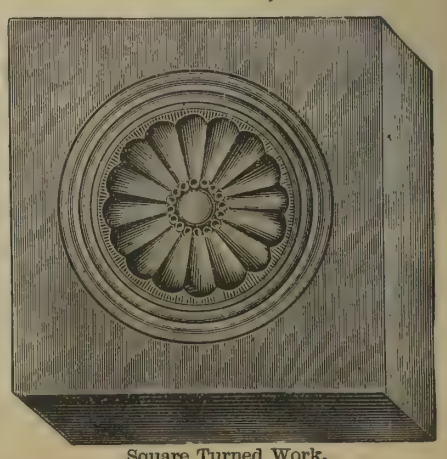

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A WINDMILL TOWER AND WATER TANK AT NARRAGANSETT PIER, R. I.

CONSTABLE BROTHERS ARCHITECTS.

[For description see page 46.]

Scientific American.

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O. D. MUNN. A. E. BEACH.

NEW YORK, MARCH, 1887.

THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

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THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

With the idea of americanizing our architecture, it was proposed that some connection be established between the students of our architectural schools and the supervising architect of the government. Precedents for such action are numerous. The building of the dome of Cologne Cathedral was cited. Other instances might be mentioned, such as the inducements offered to the graduating classes of the University at Palermo in reference to designing some portion of the great Cathedral of Milan. The project referred to was to give, as a graduation honor, a two years' appointment to service under the supervising architect. This appointment to be determined in some perfectly fair way by competition. The successful man to spend one year in the draughting room, and one year as assistant superintendent of outside construction. The usual salary paid for such services to accompany the appointment. It was believed that this scheme would identify the students of architecture, and, indirectly, the people themselves, with the art growth of our country.

Whatever derogatory may be said of the exteriors, our government buildings are acknowledged by Europeans to be the most commodious and convenient government buildings in the world; and many of the later buildings, notably the post office at Lexington, Kentucky, show a remarkable advance in architectural treatment. If, through the medium of our museums, our art galleries, our schools of design and architecture, our public and private buildings, we cannot interest this nation in its own art growth, then there is no help in us.

From a sanitary point of view, the Institute was addressed by the well-known specialist, Mr. Charles F. Wingate. The tendencies of sanitary progress were noted. It struck him as absurd that the sanitary expert should be called upon to overhaul buildings after they were completed and occupied, instead of having consulted him in advance when the plans were prepared. He dwelt upon the importance of a dry site and a house free from dampness. The prevalence of consumption and a large number of other ailments is directly traceable to damp soil and improper drainage. The exceptionally low death rate of London is to be ascribed, largely, to its perfect soil drainage, while the high mortality in New York from zymotic diseases is due chiefly to damp cellars upon a saturated subsoil. The details of interior plumbing work was cited to explain the cause of the late typhoid fever outbreak in Brooklyn. The necessity of a trap to disconnect dwellings from street sewers was urged, and the enlargement of soil pipe at the roof to the full sum of the areas of the small pipes leading to it was insisted upon. Air inlets came under the same heading, and were recommended to be as large as the house drain. That a contrary practice prevails to some extent is unquestioned. Methods of sewage disposal were considered. The irrigation system was criticised in certain particulars, and the necessity for some cheap and universally applicable substitute for cesspools emphasized. The speaker regarded the lack of ventilation in dwellings as the most serious source of injury to health. Impure and overheated air is a prime factor in creating disease. The public generally resort to window ventilation as a relief from oppressive air. Open fireplaces are a luxury, and, as such, must be considered unavailable to the mass of humanity. To find a house or any part of it well ventilated is as rare as a jewel. Within a recent period, improvements have been made in the construction of electric motors, so that, by means of small fans operated by these motors, it is now practicable to ventilate any room or building at a trifling expense. An electric motor that formerly cost $135 can now be made for one-fifth that amount, and foul air, by its means, can be forced out of a room, even in winter, without creating a draught, while in summer a cool current can be blown inward. This is one of the most remarkable improvements in modern science. It is not a monopoly, as several appliances of the kind are now in use and successfully working. Ventilation has been as good as a lost art. It now bids fair to take proper rank among modern sciences. A house may be the home of defective plumbing, leaky drains, or built on saturated soil; but if impure air can be driven out and pure air drawn in to take its place, the noxious vapors which are not forced out may be so diluted as to be rendered almost harmless.

Many of the members availed themselves of the courtesy of Prof. Ware to visit the architectural department of Columbia College, to inspect the system of instruction pursued there, the work of the students, and, lastly, and to some minds the most important, the now famous Kansas City Exchange competitive drawings. It was generally conceded that the successful drawings were worthy of the honor awarded them. The amount of work on each set of the drawings, singly and collectively, forced upon almost every beholder the conviction that a vast amount of time, labor, and genius were wasted on competitive drawings. The home of Mr. Marquand was thrown open to inspection of the members, and to say that the quaint elegance of its costly rooms, the seductive beauty of its mural paintings, the refined taste displayed in every adornment and enrichment, made a deep impression, would be merely to pass one more encomium upon the growth and beauty of American art.

The general feeling of the Institute in regard to unity of action among the members was announced in the report of the Board of Trustees. It was stated that the Institute cannot progress or maintain its hold upon the respect of the public without the steady support of its individual members. The evils of unregulated practice were incidentally alluded to. In order that the professional architect shall do the best work he is capable of doing, in order that he shall do something for the art growth of the country, for the sake of art and the country itself, and in order that he shall raise the standards of comparison and estimation, he must have the moral support of the people themselves. Can the profession accomplish this and be in conflict with itself?

At this session of the convention, grave charges of unprofessional conduct were preferred against a member of the Institute. Documentary proof was offered in support of these charges. They were referred to a committee for examination and a report. The evidence was found to be complete. The offending member was requested to resign, and in this way the pernicious evil was rebuked. The constitution of the Institute forbids the expulsion of a member for unprofessional conduct. Other organizations, similarly united for mutual protection and defense against the pretensions of quacks or pettifoggers, are obliged to resort to expulsion to restore to the association its proper *esprit de corps*.

In the discussion which followed the substantiation of these charges, several members advanced the recommendation of a more careful inquiry into the antecedents and present standing of applicants. The sense of the convention in regard to the measures to be taken to avoid a repetition of such charges was not fully brought out, but, admitting the wisdom of the recommendation alluded to, it does not strike at the origin of the trouble. Perhaps it is impossible to enact a law that will, but it seems that the disgrace of expulsion to a member in good standing must greatly exceed the discomfiture of a rejected applicant. To the former, the blow is equivalent to a dishonorable retirement from the profession. To the latter, it does not necessarily imply disgrace. It may mean simply inefficiency, or incapacity, or want of experience, the latter of which may be overcome by study and time.

The annual dinner, on the evening of the second day, was given at Pinard's; and in the excellent discussions of art topics, in the quiet but timely hits at the architectural follies of the day (for even architects will admit that they sometimes imitate their clients, who do have follies), in the good fellowship that prevailed, and in the social amenities of the hour—perhaps it was more than one hour—the dinner may be pronounced a success. As a matter of reference, the names of the officers chosen for the ensuing year are herewith appended:

Thomas U. Walter, of Philadelphia, president.

O. P. Hatfield, treasurer; A. J. Bloor, secretary; both of New York.

The board of trustees are: H. M. Congdon, N. Le Brun, E. T. Littell, R. M. Upjohn.

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The secretary of foreign correspondence: W. L. B. Jenny, Chicago.

DESIGN FOR A WINDMILL TOWER AND WATER TANK.

We give on our first page a design for a windmill tower, which is worthy of attention for the novelty and boldness of its conception. It is a striking departure from the common plan of such structures, which are ordinarily made to resemble some old barn or outhouse, devoid of taste or elegance. This design shows how prettily such a subject may be treated. The example we give will serve, we hope, a useful purpose in leading owners and builders to think and study how they may improve the forms and lines of all such structures. A little care and thought will sometimes do wonders. Our engraving is from the *Real Estate Bulletin*. This windmill was recently erected at Narragansett Pier, R. I., by Edward Earle, Esq., to supply water for ten cottages built by him at that place. It was designed by Constable Brothers, engineers and architects of this city, and, in its position among the summer cottages at Narragansett Pier, forms a very ornamental addition to the landscape. The water is supplied by driven wells, and is pumped up by the wind power into the reservoir at the top ot the tower, whence it is distributed by gravity pressure

throughout the ten cottages erected adjacent to it. It has proved adequate for all demands made upon it, and not only furnishes an abundant supply of water for domestic purposes, but provides an ample means of fire protection.

A ONE STORY DWELLING.

We illustrate this month, in our colored plate and sheet of details, a style of dwelling much in demand in the southern parts of the country, in which the whole plan is arranged on one floor. The design, drawings, specification, and estimate are by Mr. Christopher Myers, architect, of Montclair, N. J.

There are several important advantages attached to the adoption of an arrangement of this kind. Chief among them is the facility afforded for access to the rooms, and the saving of stairs. The system has the further gain of producing a warmer house, and one which, from the exterior, gives the impression of large extent.

In order that our readers may derive the fullest advantage from the design, the architect has drawn up a complete bill of quantities, with the cost of the various items attached. This we print below. In adapting the design for erection in any particular locality, where the prices differ from those given, it will be an easy matter to adjust the difference. In the vicinity of New York, the building would cost $4,828.77, as shown by the items in the bill of quantities. To ascertain the cost of building in other localities, where labor or material is either cheaper or dearer than in New York, a corresponding reduction or increase must be made in the items affected.

The design is entirely a practical one, and has been carefully considered in the smallest detail. The elevation is very skillfully treated. As a matter of fact, it is very difficult to obtain a satisfactory elevation in this class of house. The great length compared to the height, unless very carefully treated, will always have the effect of a squatty appearance.

Mr. Myers has managed to overcome this difficulty by cutting up the sides of the building with a number of breaks and offsets, providing several hips and gables, and in constructing two turrets. The external details are effective, while being simple and moderate in cost, and the whole result is a most attractive elevation, with excellent skylines and a certain homelike aspect that will be generally admired.

The planning has been arranged in a manner which, although, perhaps, not open to much improvement, could be readily altered to adapt itself to special requirements. For instance, the main staircase in the hall occupies a good deal of space, and could be omitted altogether, if it were not intended to use the attic, thus leaving a hall measuring 12 feet 8 inches by 23 feet 8 inches. The position of the bath room would then be slightly altered, or it might be left out altogether. On the other hand, if the house were constructed exactly as it is represented on plan, the attic could be finished off and utilized for bed and other rooms.

It will be observed that the kitchen forms a wing, distinct from, although attached to, the main block, and the advantages of such an arrangement are too obvious to need comment. At the South, where one story houses are common, it is usual to detach the kitchen entirely, and it will be seen that this could be done in this case without in any way interfering with the main design as it stands. The kitchen has a large bedroom over it, which could be easily divided into two if necessary, and a cellar beneath.

On the plan shown on the colored sheet it was found necessary to cut off a portion of the kitchen. On the detail sheet, however, we give this plan in full, with the dimensions of the various parts.

SPECIFICATION.

Specification of the work required to be done and the materials to be supplied in the complete erection and finishing of a frame dwelling house, from the designs and under the superintendence of Christopher Myers, architect, Montclair, N. J.

General Conditions.—The drawings taken in connection with this specification are intended to provide for the complete erection of the house in all respects. If anything necessary for such completion should either be omitted to be mentioned in the specification or shown upon the plans, the same is to be executed without extra charge, to the true intent of the said drawings and specification.

The work is to be done in a thorough and workmanlike manner, and to be finished in all respects to the entire satisfaction of the architect.

MASON'S WORK.

Excavating.—Excavate cellar under kitchen to a depth of 4½ feet; all foundations 30 inches deep; the cellar wall to be 1 foot 4 inches thick, built of field or quarry stone, to height of 7 feet in the clear; all foundation walls to be level with kitchen wall; all the stonework exposed to view to have struck joints in cement; inside of cellar walls to be pointed flush; the trenches and under foundations of all brick piers and under walls, and chimneys, to be grouted in with cement grouting. Build brick piers where shown on plans, of good hard burnt brick. Build chimneys where shown, of good hard burnt brick. Joints for all flues to be struck. Brick for the top to be selected. All chimneys to have bluestone caps and bond stone, each 3 inches thick. Build kitchen fireplace with front brick laid in red mortar, with bluestone shelf and hearth, both rubbed.

Hearths.—Furnish all fireplaces with rubbed bluestone hearths; furnish and put in all necessary thimbles where directed.

Cementing.—Cement the entire cellar bottom of kitchen cellar with cement composed of 2 parts of sharp screened gravel and 1 part of Rosendale cement.

Plastering.—Lath and plaster the entire first story of main house and first and second story of kitchen, 3 coat work; scratch brown and sand finish; the closets to be laid on in two coats, also plaster privy in two coats. Furnish and set four center pieces in parlor, library, dining room, and hall, to cost seven dollars in all and to be selected by owner.

Privy Vault.—Build privy vault of stone 6 feet x 5 feet and 4 feet deep.

Stoop Stones.—Put down stoop stones where shown, to be of good heavy bluestone, in two lengths to each stoop and two feet wide, these stones to have foundations 26 inches deep, filled in with small stone.

Cistern.—Build cistern 10 feet x 10 feet in the clear, of good hard burnt brick, domed over on top with manhole and flat bluestone on top 2 feet square. Cement the inside with Rosendale cement, and leave perfectly tight.

Cesspools.—Build cesspools where directed, within 60 feet from the house; one to be 8 x 8 feet in the clear, built of brick and cemented inside and made tight, and the other of rough field stone laid in dry, both to be domed over on top and to have bluestone 2 feet square. Run a 4 foot pipe from one to the other turned down in the tight one.

Drain Tiles.—Run a system of tile pipe 4 inches from all the leaders to cisterns with well cemented joints.

CARPENTER'S WORK.

Size of Timber, etc.—Sills, 3 × 8 in. laid flat; summers, 6 x 10 in.; first and second tier beams, 2 x 10, placed 16 in. on centers and bridged every 8 ft. where space will permit; main post, 4 x 6 in.; plates, 4 x 6 in.; main rafters, 2 x 8 in., 24 in. on centers; piazza rafters, 2 x 6 in., 24 in. centers; piazza ceiling beams, 2 x 6 in., 24 in. centers; hip rafters, 2 x 8 in.; valley rafters, 3 x 8 in.; ridge pieces, 2 x 8 in.; all studding, 2 x 4 in., 16 in. on centers, all door and window studs to be doubled, all door and window heads to be doubled, these studs to be well spiked at tops and bottom; piazza sills, 3 x 7 in., beam, 3 x 8 in.

Sheathing.—Sheathe all the vertical sides with matched hemlock boards laid diagonally.

Siding.—Put on siding where shown on plans, 6 in. Michigan strips, laid 4¼ in. to the weather.

Paper.—Paper all the vertical sides with No. 30 Manila building paper, lapped well and laid under all eaves boards and window and door frames.

Shingles and Lath.—Lath the entire roof with 1 x 2 in. spruce lath laid 5 in apart; cover these with best xxx 18 in. pine shingles, laid not more than 5 in. to the weather.

Cornice.—Form cornice as shown on the details, of good soft pine lumber.

Side Shingling.—Shingle the sides of building where marked, the bottom course to be rounded or hexagonal, as shown.

Window and Door Frames.—Make window and door frames as shown on the plans. Windows to be made for double sliding sash, hung on weights and cords. Door frames to be made with rabbeted jambs and 1¼ in. outside casing.

Water Table, Corner Boards, etc.—Put on water table as shown on plans, of good soft pine lumber. Corner boards, 1¼ x 5½ in.

Piazza, Stoops, etc.—Put up piazza as shown on plans and details, cornice and ceiling as shown, the floor of piazza and stoops to be laid with narrow matched boards laid in white lead joints and blind nailed; put up all lattice, stoops, etc., to suit the grade.

Tinning, Leaders, and Flashing.—Put in all necessary gutters and valleys of I. C. charcoal tin, 2 ft. wide, also put up all necessary 4 in. leaders to convey water to ground, with copper tubes in gutters. Do all necessary flashing of every description.

Ornamental Work, Brackets, etc.—Put up all necessary ornamental work, as shown on the elevations, of good, clear, soft pine. See details.

Finials.—Finish and set boxed wood finial on one spire, and furnish and set one metal finial of some neat design on the elevations.

Blinds.—Furnish and hang complete, painted outside, rolling blinds on all first story windows and second windows in kitchen. No blinds on cellar or second story of main part. The blinds to have domestic fastenings where needed, and all other fastenings to make them complete.

Sashes and Glazing.—All sashes to be made as shown on the various elevations, and glazed with second quality, double thick, French sheet glass, the cellar and attic single thick. All this glass to be well puttied.

Floors.—The entire first floor, except kitchen and bath room, to be laid with sound narrow tongued and grooved pine boards. Kitchen and bath room, yellow pine. Second story to be floored with wide flooring pine, all well laid and nailed.

Partitions, Bridging, etc.—Set all partitions, where shown on the floor plans, with 2 in. x 4 in. joist, 16 in. on centers, and well nailed at both ends. Bridge these partitions with 2 in. x 4 in. midway up, put in horizontally, and well nailed at each end. Bridge all the floor beams with 2 in. x 2 in. herringbone bridging, accurately cut at each end, and well nailed.

Grounds.—Furnish and set all necessary grounds for mason to finish to.

Door Jambs, Trimmings, Bases, etc.—All door jambs to be 1¼ in. thick, rabbeted; all casings as per detail; bases scribed to floor.

Wainscot.—Wainscot the kitchen 3 ft. 6 in. high, with 3 in. yellow pine strips with bead on edge, and finish with nosing and cove finish; bath room the same.

Stairs.—Build main stairs, as shown on plans, with 1¼ in. treads, ⅞ in. risers, 1¼ in. strings, these to be inclosed with narrow pine ceiling 3 in. wide, forming rail on second floor. The kitchen stairs in similar manner. Build cellar stairs of rough spruce plank.

Bath Room.—Finish bath fittings in ash, top and facing to tub, facing to wash bowl, riser, seat, and lid to water closet; all these doors and lids hung with brass butts.

Doors.—The front door to be made in two sections, 2 in. thick by 8 ft. high, and moulded, paneled, etc., as shown on front elevation, and to have glass in upper panel, of French plate glass; all other room doors to be 1½ in. thick, four paneled and flush moulded; closet doors 1¼ in. thick, made in same manner. All doors to have hardwood saddles. All hearths to have hardwood hearth borders. All doors, where needed, to have rubber tipped bumpers.

Corner Beads.—All exposed plaster corners to have corner beads, nailed on with turned ends.

Closets and Pantries.—Kitchen and dining room closets to have a tier of five shelves high. Kitchen pantry to be regularly shelved. Bed room closets to have two shelves, with hanging hooks underneath.

The niche on either side of library windows to be regularly shelved up; all these shelves throughout to rest on rabbeted cleats neatly nailed to the wall.

Hardware.—All the double hung windows to hang on cast iron weights and to have Italian sash cord, and to have an improved bronzed sash fast; all windows which swing to hang on tight 3 x 3 butts, including cellar; all these windows to have proper hooks and fastenings. The front door to be hung on 5 x 5 in. imitation bronze butts, two to each door, and to have an improved lock and night latchment, with bronze knob outside and brass face flush bolts, to fasten doors together. Sliding doors to have "Hatfield" patent anti friction sheaves with brass track and astragal sliding-door locks, brass face and brass flush handles. Other doors to be hung with 4 x 4 in. imitation bronze butts. All room doors to have 4½ in. mortise locks, brass face, city make; all closet doors to have reverse bevel rim locks, the knobs throughout to be jet and bronze. Furnish all necessary wardrobe hooks, catches, buttons, hooks, small bolts, etc., and everything to complete the job.

Privy.—Build privy 6 x 5 ft. and 7 ft. high, to be studded for plastering, and exterior finished same as house; to have seats with covers to holes, hinged panel door, and two small windows.

Coal Bins.—Build coal bins in cellar, where directed, of rough hemlock boards.

Tubs.—Build and put up three wash trays, where directed, of 2 in. clear well seasoned white pine, jointed together in white lead, and set on turned legs, and to have 1¼ in. hinged covers.

Mantels and Grates.—The mantels and grates will be furnished by the owner, and contractor is to allow $200 for same.

PAINTER'S WORK.

The whole of exterior of building to be painted two good coats of English white lead and linseed oil in such colors as may be directed; all tin work to be painted two coats of "Prince's" metallic paint. Chimneys painted same as house, all sashes cut in; also paint the bottoms of all outside doors and tops and bottoms of sashes; all knots and sap to be coated with shellac before priming is done; putty up all nail holes and cracks, joints, etc., and after priming is done, the outside of privy to be painted same as the house, the inside to be painted white.

Inside Finish.—The inside to be finished with "Wheeler's" wood filler well picked out, and to be treated with two coats of hard oil finish, rubbed down on the last coat. All the nail holes to be puttied up, color to match that of wood. All door saddles and hearth borders to be oiled, the hard floors to be oiled and rubbed down.

PLUMBER'S WORK.

Drain Pipes.—Furnish and put in where shown on the plans a 4 in. cast iron drain pipe, to run from inside of building out to the tile drain 4 ft. outside of building, the drain tile to be trapped inside of the cel-

lar wall, and to be supplied with fresh air from the outside of building, with iron pipe run through the foundation, and to have a perforated cover, as directed by the architect. In every case use Y branches for all iron pipe connections.

Soil.—Furnish and connect with drain in cellar a 4 in. cast iron soil pipe, and run same up to at least 4 ft. above roof, and cap with the "Smith" patented ventilating cap. Use Y branches for all waste connections. Coat the iron pipe with asphaltum, and in the cellar insert a 4 in. cleaning cap.

Calking.—All joints of all iron pipes are to be thoroughly calked with oakum and molten lead, and fastened in position with iron hooks. All joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipes, and lead pipes soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on the plans a 35 gallon copper boiler, and provide with drain cock for emptying the boiler and with shut-off cock for shutting the water off from second story. Provide with circulating pipe complete. Connect boiler draw cock with the sink waste. Put in a combined safe and cockrun valve on pipe at top of boiler. Boiler to have the "Lockwood" stand.

Exhaust.—Run from the highest point in hot water pipe a ½ in. lead pipe, to carry same 1 ft. above tank top, and bend over.

Pump.—Furnish and set in kitchen, where shown on plans, a No. 2½ "Douglass" horizontal double acting suction and force pump, brass lined, and connected to a 1¼ in. B lead suction pipe. Insert an air cock, to prevent pipe from freezing in cold weather.

Supply.—From the pump carry a 1 in. A lead pipe to enter bottom of tank, the same to act as a house supply. Place a 1 in. finished stop with waste on the pipes in bath room. Provide a check valve near pump, so that cold water over sink must be drawn by pumping. Hot and cold supply all through the house to ⅝ in. A lead pipe. And all pipes are to be graded so they will drain perfectly dry. Control each floor separately by ⅝ in. finished stop and waste.

Sink.—Sink to be 18 in. by 30 in., of galvanized iron, with two front legs, trapped with 1½ in. trap and lead waste of 1½ in. connected to the 2 in. iron soil under floor; also insert a cleaning cap at the point. Sink to be supplied with hot and cold water through ⅝ in A lead pipe and through "Peck's" improved lever handle bibbs. Flash the woodwork back of sink with 3 lb. sheet lead 15 in. high.

Bath.—Furnish and put up, where shown on the plans, a 16 ounce tinned and planished bath tub 5 ft. long, supplied with hot and cold water through ⅝ in. A lead pipe. To have a nickel plated combination compression bath cock, with rubber hose and sprinkler. Waste through a 1½ in. trap and 1½ in. C lead pipe, properly connected to main soil. Furnish the nickel chain and plug.

Bowl.—Furnish and set, where shown on the plans, a 14 in. patented overflow wash basin of best Italian marble, with countersunk marble slab 22 in. by 30 in., and back 10 in. high, supplied with hot and cold water through ½ in. A lead pipe and "Peck's" improved nickel plated basin cocks. To have 1¼ in. D lead waste pipe trapped with a 1¼ in. trap, and properly connected to main soil. Furnish nickel chain and plug and fancy chain stay.

Air Chamber.—Place no cocks on end of pipes, but extend pipe at least 6 in., so as to provide an air chamber.

Water Closet.—Furnish and set in bath room, where shown on the plans, one "Inadosa" all-porcelain washout closet, with drip tray, also set up a painted iron cistern with flush tank attached. Supply cistern through ⅝ in. A lead pipe from main tank cistern, to supply closet through 1¼ in. D pipe. Ventilate the closet trap with a 3 in. lead pipe calked into main soil. Insert the nickel cap and pull in the seat.

Safe Pans.—The bath tub, bowl, and water closet are to be provided with 3 lb. lead safes, turned up 2 in. all around, and to have ¾ in. D waste pipe running to cellar.

Wash Trays.—Supply wash trays with hot and cold water through ⅝ in. A lead pipe, and brass tray bibbs with flanges and thimbles. Provide an 1½ in lead waste, connected to main soil, and properly trapped. Provide necessary chains and plugs of brass. Every trap to be placed as near to the fixtures as possible. Every trap in house to be separately ventilated, the same size as trap, and either connect with main soil above bath room fixtures or run independently to 4 ft. above roof line, and there cap.

Range.—Furnish and set a "Newport" range, and connect with boiler. The hot water pipe from range to boiler to be ¾ in. A.

Tank.—Line the tank, as given on plans, with 16 oz. tinned sheet copper, and leave complete with overflows and inlets.

Gas Pipes.—Put up gas pipes with outlets, as shown on the plans, and according to the rules of the gas light companies. All outlets are to be capped, and all pipes tested. All side lights are to be not less than 5 ft. 6 in. from floor. All drop lights to be hung plumb.

ESTIMATE AND BILL OF MATERIALS AS PER SPECIFICATION ABOVE.

Mason's Work, etc.	Each.	
115 cubic yards excavating	$ 25	$25 75
8 brick piers complete	3 00	24 00
4 stoop stones laid complete	10 00	40 00
66 perches stone work	4 50	297 00
38 perches filling to trenches	2 00	76 00
286 feet cement bottom	4	11 44
2 cesspools complete		40 00
1 cistern		50 00
1 privy vault complete		8 00
Drain tiles complete		30 00
1 chimney complete		180 00
890 yards sup. plastering	40	356 00
4 center pieces		7 00
1 bluestone hearth and shelf set		20 00
Incidental expenses		25 00
Total		$1,193 19

No. of pieces.	Size.	*Carpenter's Work.*	
2	3″×8″×24′ 0″	= 96 feet.	
2	" ×25′ 4″	= 101 "	
1	" ×29′ 4″	= 59 "	
1	" ×18′ 0″	= 36 "	
1	" ×17′ 0″	= 34 "	
2	" ×21′ 0″	= 84 "	
2	" ×16′ 0″	= 64 "	
		=	474 feet.
35	2″×10″×16′ 0″	= 934 feet.	
64	" ×13′ 0″	=1,387 "	
40	" ×11′ 0″	= 734 "	
48	" ×14′ 0″	=1,120 "	
30	" ×17′ 0′	= 850 "	
		=	5,052 feet.
31	2″×8″×16′ 0″	= 662 feet.	
40	" ×12′ 0″	= 640 "	
14	" ×14′ 0″	= 261 "	
45	" ×18′ 0″	=1,080 "	
4	" ×21′ 0″	= 112 "	
8	" ×20′ 0″	= 213 "	
1	" ×24′ 0″	= 32 "	
1	" ×32′ 0″	= 43 "	
1	" ×26′ 0″	= 35 "	
16	" ×13′ 0″	= 277 "	
		=	3,355 feet.
2	4″×6″×24′ 0″	= 96 feet.	
4	" ×16′ 0″	= 128 "	
1	" ×25′ 0″	= 50 "	
3	" ×12′ 0″	= 72 "	
3	" ×15′ 0″	= 90 "	
4	" ×18′ 0″	= 144 "	
1	" ×20′ 0″	= 40 "	
1	" ×14′ 0″	= 28 "	
1	" ×28′ 0″	= 56 "	
		=	704 feet.
2	4″×4″×22′ 0″	= 59 feet.	
2	" ×16′ 0″	= 43 "	
		=	102 feet.
6	4″×6″×16′ 0″	= 192 feet.	
8	" ×20′ 0″	= 320 "	
25	" ×14′ 0″	= 700 "	
		=	1,212 feet.
80	2″×4″×16′ 0″	= 853 feet.	
400	" ×14′ 0″	=3,733 "	
		=	4,586 feet.
1	3″×7″×20′ 0″	= 35 feet.	
1	" ×24′ 0″	= 42 "	
1	" ×18′ 0″	= 32 "	
1	" ×14′ 0″	= 25 "	
1	" ×27′ 0″	= 47 "	
		=	181 feet.
3	2″×7″×12′ 0″	= 42 feet.	
2	" ×18′ 0″	= 42 "	
1	" ×16′ 0″	= 19 "	
1	" ×14′ 0″	= 16 "	
1	" ×20′ 0″	= 23 "	
2	" ×24′ 0″	= 56 "	
1	" ×22′ 0″	= 26 "	
		=	224 feet.
			15,863 feet.

	Each.	
15,863 feet dimension timber laid on	$ 25	$396 58
30,000 18″ pine shingles laid on roof	7 50	225 00
840 1×2×12 shingle lath laid	7	58 80
12,000 18″ pine shingles for vertical sides laid on	7 50	90 00
3,200 feet matched sheathing and paper for vertical sides laid on	25	80 00
1,200 feet 6″ siding laid on	40	48 00
5,500 " main and piazza cornice put up	55	302 50
265 feet water table put on	30	79 50
3 square columns back porches fixed	2 00	6 00
4 turned columns front piazza fixed	3 00	12 00
1 stoop post put up	1 50	1 50
50 feet piazza rails and balusters put up	45	22 50
53 feet facia and lattice put up	$ 40	$21 20
Front steps complete		18 00
Three other steps complete		25 00
575 feet piazza and stoop floors laid	8	46 00
550 feet piazza ceiling laid	8	44 00
200 " five inch corner board	5	10 00
4 large brackets	2 50	10 00
2 radiators on side gable	3 50	7 00
Ornamental filling in piazza gables		12 00
5 sections of ornamental filling front piazza	8 00	40 00
1 wood finial on spire		4 00
1 metal " "		10 00
Tin work and conductors		60 00
225 feet band course at bottom of shingles	20	45 00
2,200 feet first floor laid complete	5	110 00
2,000 " second floor laid complete	5	100 00
4 cellar windows complete	2 00	8 00
22 first story windows with blinds	14 00	308 00
6 second story windows, blinds over kitchen	10 00	60 00
28 doors complete, hung and trimmed	10 00	280 00
400 feet 7″ base and moulding	6	24 00
8 closets finished complete	3 00	24 00
Finishing bath room complete		20 00
Cellar stairs complete		5 00
Kitchen stairs complete		22 00
Front stairs complete, including ceiling		50 00
Mantels and setting, including grates		225 00
Outside privy		15 00
Incidental expenses and jobbing for other trades		150 00
		$3,075 58

Summary.

Mason's work	$1,193 19
Plumber's work as per specification	310 00
Painting outside and finishing inside	250 00
Carpenter's work	3,075 58
Total	$4,828 77

A $2,600 COTTAGE.

A portion of the colored plate accompanying the present number represents a cottage of pleasing appearance, lately erected for Mr. W. P. Macomber at Portsmouth, R. I. The treatment of the roof and convenient arrangement of the rooms are both very satisfactory, and the whole design is one of considerable merit and usefulness.

Mr. George W. Cady, the successful and well-known architect, of 164 Westminster Street, Providence, R. I., is the author of the design.

A number of detail drawings, with roof plan and elevations, are shown upon our supplementary sheet, and following is the specification used in the erection of the building:

SPECIFICATION OF A DWELLING TO BE BUILT ON THE OWNER'S LOT, AT PORTSMOUTH, R. I., FOR MR. W. P. MACOMBER.

The house to be as per plans and figures on the same, substantially as shown, all dimensions to be verified on the works.

Excavator.—The cellar the full extent of the house. Trenches for foundation of steps or piers, and cross wall, pipes for drain, chimney foundations, and cesspools and cisterns to be dug the required depth, and all dirt not wanted for grading to be carted off. The loam to be saved by itself. Cellar 7 ft. 6 in. deep in the clear. All outside piers, etc., 2 ft. 6 in. under surface to their foundations. Cesspool 20 ft. from the house; size, 10 ft. deep, 6 ft. at the bottom, tapering to top, and covered over with flat stone under surface 2 ft. House foundation stone, 6 in. under cellar bottom. The same for chimneys.

Walls.—The cellar walls to be built up 18 in. thick, laid in cement mortar, underpinning faced both sides. Outside rubble work, natural face, the joints struck. Cellarway jambs the same. Chimney piers good common work.

Cross Walls.—The several cross walls to be of brick, laid in mortar, close up to joists, and between joists up to floors, using good, hard building brick. The piazza piers to be Danvas brick.

Chimneys.—To be built as per plans. Hearth places arched to trimmer. The several fireplaces to be laid up with Danvas pressed brick. The tops to be the same. Flash with 3 oz. lead at roof. The shaft to be good brick, laid full in mortar. Black mortar in the fireplaces and tops. The shaft to be plastered directly on the brick, on the outside, from cellar to roof. Pipe rings of 6 in. vitrified pipe to be built in where required.

Cesspool.—To be stoned up, and covered with stone or brick arch. Six inch vitrified drain pipe, to be run from house to it, trapped outside of wall, all well cemented, tight and secure.

Lath and Plastering.—The first and second stories to be lathed on sides and plastered. One good coat of spruce lath, well nailed, and good, strong mortar. Slake and run lime through sieve. Mix with clear grit sand and cattle hair in proper proportions. Put on and float. The three rooms and hall in the attic to have one good coat, sides and ceiling.

Pointing.—Point and whitewash the cellar walls.

Cement.—Cellar steps to be bluestone, with brick pier. Window stools rowlock course of brick laid in cement. Cellar bottom to be cemented in the hall and wash rooms 2½ in. thick, level and true in the Rosendale cement and sand, in proportions of 1 to 3.

Cistern.—A cistern to be dug to hold about 2,000 gallons, to be cemented on the earth secure and tight, with overflow to a dry well. The inlet pipes to be 3 in. vitrified drain pipe, leading to the conductors. This pipe to run to the bottom of the cistern (will require 25 ft. of pipe). The pump pipe to be cemented in the bottom end, to be covered with a beehive brick filter.

CARPENTER'S WORK.

Generally.—The building to be well framed, with good mill sawed spruce timber, spiked and nailed securely together. Sizes as follows: sills and posts 4 in. x 6 in., piazza sills 6 in. x 6 in., resting girts of second floor, at ends of joist, 4 in. x 6 in., cross beams 6 in. x 8 in. Frame in end floor joist and halve studs, plate 4 in. x 4 in., joist 2 in. x 8 in., 16 in. centers, 4 in. x 8 in. under cross and openings, and for trimmer heads and joist, ceiling joist, attic 1¼ in. x 6 in. Also over L, studs, 2 in. x 4 in. outside, 16 in. centers, curb of L 2 in. x 8 in. Rafters, 1 slant 2 in. x 4 in., 2 ft. center, upper 2 in. x 8 in. cambered. Main rafters 2 in. x 7 in., hips and valley rafters 2 in. x 8 in., 2 ft. centers, ridge 1 in. x 8 in., inside main partition 2 in. x 4, 16 in. centers, double at doors and trussed, others 2 in. x 3 in. Set all partitions under 3 in. x 4 in. plate. Notch on joists, etc. Plate of piazza 4 in. x 6 in. Rafters 2 in. x 6 in., planed and jack planed cornered, ½ in. ends from bracket, main rafters the same, all as per plan and details.

Boards.—Boarding of piazza roof 1⅛ in. planed, matched, and beaded spruce, laid smooth side down. Top roof of L the same, ⅞, not beaded. Back porch roof the same as the front. Other boarding on sides and roof to center of band on sides, mill planed hemlock, square edge. All well nailed.

Boarding below the band to be ⅞ in. weather boarding, 5 in. widths, sound seasoned pine, Michigan strips, nailed square through. Band, ⅞ in.; corner boards, 6⅞ in.; base ⅞.

Jett.—Main jett and other finish pine, and as plans and detail. The gutter on the main house to be trimmed. Two 3½ in. tin outlets will be put in where directed to connect conductors. The valleys will be shingled open, on one width of tin strip, painted both sides before the shingles are laid. Fastenings will be put in where required. A 4 in. dug out pine gutter will be put in at the flat on L, and the water supply the tank. Two short pieces of the gutter to be put from valley to it.

Roof.—The main roof and piazza and porch roofs to be shingled with first quality of Eastern shaved shingles, laid out not over 5 in. to the weather, and well nailed. The gable and sides to be 4 in., shingled with the same kind, laid not over 5½ in. to weather, and nailed as above. So much as comes in the gables will be clipped on but 1 in.

Paper.—Between the studs of the first story, put resin sized sheathing paper against the boarding, secured with a lath or strip nailed to stud.

Door Frames.—Cellar door frames rabbeted, 3x4 joist for size of doors required. All other door frames rabbeted plank of the kind of stock that may be chosen.

Window Frames.—The cellar window frames to be rabbeted pine plank, as per sizes given, 1¼ in. sash, to be hung with butts, and fasten down with button and up with hook and staple, ⅛ in. wire.

Main.—All the other window frames to have hard pine pulley stile, plowed for spline and bead, 1⅜ in. lip sash, sizes given, plank stools, and as per plans, all to be fitted with Sweet's spring on top and bottom sash, also with thumb lifts.

Partition.—All the several partitions to be well set, and the furring complete to receive the lath. Carpenters will cut for pipes and case where required.

Iron Roof.—The flat part of the roof to be covered with Smith's patent iron roofing, painted two coats.

Floors.—The attic floor to be ⅞ in. planed and matched spruce, well driven up and nailed. Other floors, except as hereafter designated, 1⅛ in. spruce, as above. Kitchen, closets, bath room, and back hall floors 1⅛ in. Southern hard pine, as above. Piazza and porch floors the same, square edge. Dining room floor, alternate strip of cherry and maple, 3 in. in width.

Sides.—The sides of the kitchen, back halls, and back stairs, also the bath room, well sheathed upright, 3 ft. high, with Southern hard pine, ½ in., as above, on the top edge, 1½ in. moulding.

Stairs.—Back stairs built with side partition of ⅞ in. hard pine, treads 1⅛, risers ⅞, and cove the same. Cellar flight the same, flight to attic the same.

Front.—The front flight to be post and rail stairs, all ash, treads 1⅛ in., risers ⅞ in., strings 1⅛ in, rail 2 in. x 4 in., post 4 in. x 4 in., turned top and bottom, balusters 1¾ in. turned pattern face band, under band, nosing and cover. Cellar sash, 1¼, two lights; attic sash, 1¼, lights as follows: Second story sash, 1⅜ lip; first story sash, 1⅜ lip. Glass to be first quality French sheet.

Doors.—Front doors will be one pair 7 ft. 6 in. x 5 ft. 1¾ in., panels as shown, upper ones glazed (plain). Vestibule doors the same size, 1⅜ in., three panels to each part. Library and dining room doors the same as vestibule. Other doors, 2 ft. 10 in. x 6 ft. 10 in. x 1⅜ in., five raised panels and cope moulding, all alike. Second story doors the same, 2 ft. 8 in. x 6 ft. 6 in., 1⅜ in., second quality. Attic doors 2 ft. 6 in. x 6 ft. 6 in., 1¼ in., four panels, third quality, all well fitted and hung. The two back doors to be 1¾ in. thick, 2 ft. 10 in. x 6 ft. 10 in., as above. Use suitable size black enameled acorn butts and flush edge bolts on double doors, top and bottom; barrel bolt on back doors, good two-lever mortise locks, brass face and strike; common butts and iron faced locks in attic; strap hinge and box lock, with thumb latch for all cellar doors, closet cupboards, etc., doors to have bronzed iron catches and pulls, suitable butts.

Hardware.—Knobs of attic, kitchen, and all doors in rear of sitting room, etc., to be white porcelain, nickel rose and escutcheons, maple strikers behind all. Doors of library, dining room, sitting room, etc., to be pearl white, bright rose and escutcheon. Front door, bright bronze, bell pull the same.

Finish.—Dining room to be finished in pine, sitting room to be finished in ash, and library to be finished in pine. Second story, front of back hall, in pine; rear room, bath, and hall, hard pine. Casings, single architrave, not to exceed 5 in. bases, 7⅛ in. with 2 in. moulding, for best rooms. 6 in. in attic and presses, press and closet casings 3 in. Band around dining room 5 in. wide moulded. Pine strip 2½ in. (shelves) in each press, 1 in closets, as may be required, stool casings.

Casings.—Case up bath tub, bowl, and seat in black walnut, as usually done.

Hooks.—put up wardrobe hooks of double pattern, in all cloth presses, one row all around.

Closets.—Closets to be finished in pine, the dining room closet to have broad shelf, under it one shelf in cupboard, and three drawers put in slide between, the other closet put up five shelves on back side and three over slide. Fit up in the other closet with broad shelves, a place for flour barrel, cupboard with one shelf, and three 2 ft. drawers, four shelves over broad shelves on two sides, all as per plans. Put up in the kitchen a wide dresser shelf, with cupboards. Set one 3 ft. 6 in. x 24 in. "Miller" sink. Case up with cupboards. Case a wash bowl in pine on the stoop. Set the 3 in. x 6 in. joist over the bath room, so as to make a tank 1 ft 6 in. lower than other ceilings, and build up a tank 3 ft. deep the size of the bath room, stud the sizes up to the roof, and line with 1⅛ spruce matched stock, all well secured.

Blinds.—To be hung to all the windows, two fold common lap slat blinds, with the best fastenings.

Conductors.—To be two stacks of 2 in. x 4 in. corrugated iron conductors, put up where the drains stop at the rear end, also two at the front to the ground.

Tubs.—Carpenters to build three plank washtubs, set the same and build a piece of floor in front of them the length and 3 ft. wide.

PLUMBING.

Line the tank 6 ft. 6 in. x 12 ft., 3 ft. deep, with 16 oz. planished copper. Put in a 3 in. copper inlet pipe from the gutter to it, also a cup top 3 in. overflow pipe to the conductor. This tank to be supplied with water from the cistern with a 2½ in. double acting force pump, located at the kitchen sink. Suction pipe 1¼ in. connecting cistern, main rise pipe 1⅛ in. to tank. Put in shut off between tank and pump, put stop cock at sink. Waste pipe to sink to be 1½ in. lead, 3 lb., well trapped, and connecting drain.

Set in bath room one 5 ft. 6 in. copper (16 oz.) planished bath tub, supply from tank, with stop, and ⅝ in. A pipe, waste 2½ lb., and trapped. Set one "Bartholomew" water closet, with S lead trap, 4 in. soil pipe of cast iron, socket joint calked with lead. Supply from tank with ⅝ in. A pipe. Set one 12 in. porcelain wash bowl, with back end and top slab of marble. Supply with ⅝ in. A pipe and stop.

Set a bowl, the same kind, in the porch, top slab wood. The soil pipe will vent out of the roof in 2 in. pipe, the water closet will vent under the seat into the chimney flue in tin pipe. All the stops, handles, etc., of the plumbing works, showing, to be nickel plated.

Fit two "Miller" sinks, supply and waste, one to be in the kitchen. Set one 25 gallon range boiler, with circulation and hot water to all in the bath room, the two sinks and one of the wash tubs. Fit the wash tubs with supply and waste, as above, for the plumbing.

Mantels.—There are to be six wooden mantels built, with the finish of the rooms, all of hardwood, 4 in. pine and 2 in. ash, at an average cost of $10 apiece. Put up a shelf at kitchen chimney of hard pine, supported on brackets.

PAINTING.

The outside finish to be painted two coats of Johns' asbestos prepared paint, as follows: Gable shingle and that on the sides red, the main finish light drab, the weather boarding dark drab, piazza floors oiled two coats. The inside hardwoods to be covered with shellac two flowing coats, the pine work painted two coats, the floors to be oiled two coats where hard woods are used, all work to be well rubbed on first coat and puttied clean, and to match wood or paint.

Generally.—This specification is intended to cover all the items to fully complete the above named house, according to the plans accompanying the specification, and the detail for the same, to the satisfaction of the owner and of Geo. W. Cady, architect.

OUR FIRST TWO VOLUMES.

The first and second volumes of our ARCHITECTS AND BUILDERS EDITION, comprising all the issues of the work from its commencement to close of 1886, are now ready for delivery, bound in handsome paper covers. Price $1.50 per volume. To be had at this office and of book and news dealers throughout the country. Those who have not seen a year's collection of our numbers put together will be surprised at the wealth and variety of contents which these volumes present, as well as at the cheapness of the price.

These two volumes contain all the numbers of the work from its commencement up to and including December, 1886. They embrace twenty-eight splendid plates in colors, representing the perspective elevations and plans of various dwellings, all having attractive features; fourteen large double sheets of details of construction of structures, nearly two hundred additional engravings of architectural subjects, public works, buildings, dwelling houses, cottages, etc., with plans; and upward of six hundred other engravings, mostly of superior character, illustrative of works and subjects interesting to architects and builders. Including all the separate diagrams and engravings of construction details, the two volumes present not far from two thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work.

A Splendid Number for April.

The next number of our paper, April, will be one of unusual excellence. One of the colored plates will present a perspective view of a dwelling of small cost, built especially with a view to alteration and enlargement at a future time, should the owner so desire. The arrangement of doors, windows, and floor plans is such as to coincide with the plans of the new enlargement whenever made. Full working drawings, a sheet of details, estimates and specifications will be given. In a following number we shall give a colored plate, showing the appearance of the same dwelling after its enlargement and improvement, with working drawings, estimates, etc.

We shall also present in our next number a series of beautiful illustrations of ornamental plaster work, showing how the interior apartments of dwellings may be greatly improved in appearance at a very small cost. These illustrations will be accompanied by practical directions for executing the work, and will be invaluable to builders and plasterers, as well as to architects and owners. In addition to the foregoing, many beautiful plates, plans, and engravings of dwellings and buildings of all kinds will be presented, of rare interest and value.

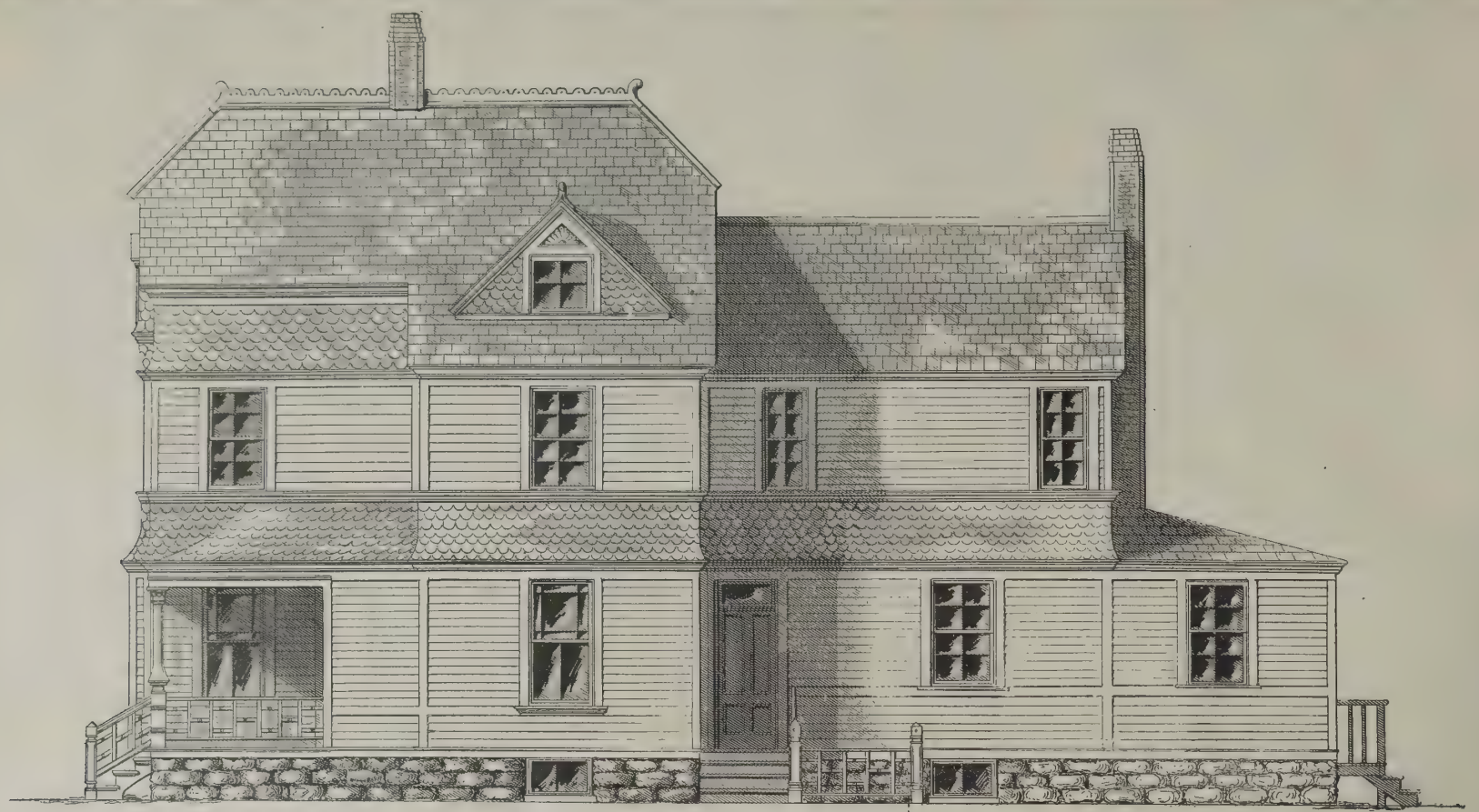
We believe there is no other building paper at present published in which so many plans, details, and specifications are regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction. Architects, builders, householders, and all who contemplate building of any kind should possess this work. It is full of useful information, and its illustrations have a permanent value for suggestion and reference.

A Notable Copper Roof.

The State of Texas, which is about completing its new capitol, will cover it with copper, using about 800 squares.

The Cincinnati Corrugating Co., of Cincinnati, Ohio, has the contract for this copper roof, which will be, perhaps, the largest amount on a single building in the United States.

A PROPER, safe working load for wire ropes is as follows: One-half inch in diameter, 1,000 pounds; five-eighths rope, 1,500 pounds; three-fourths rope, 3,500 pounds; one inch rope 6,000 pounds. This is for nineteen wires to the strand, hemp centers.



SIDE ELEVATION

A Suburban Dwelling.

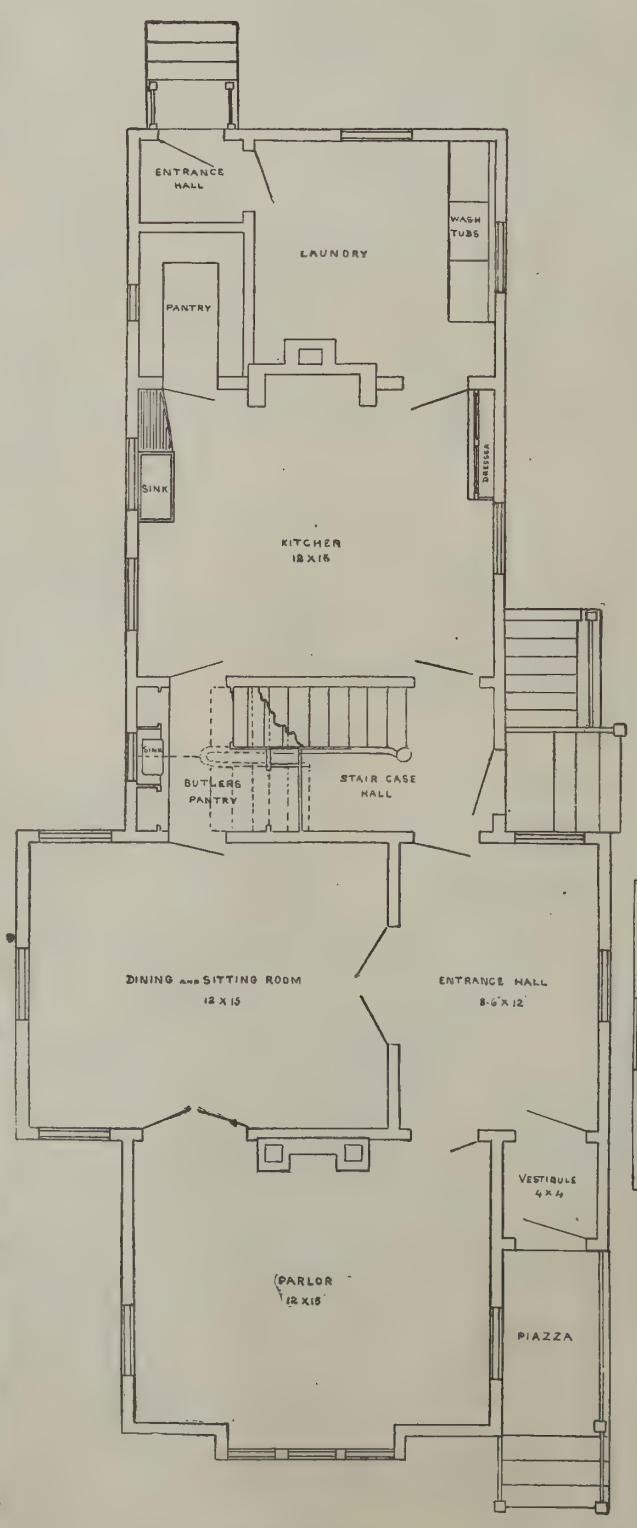
Cost, $2,800.

Charles G. Jones, Architect,

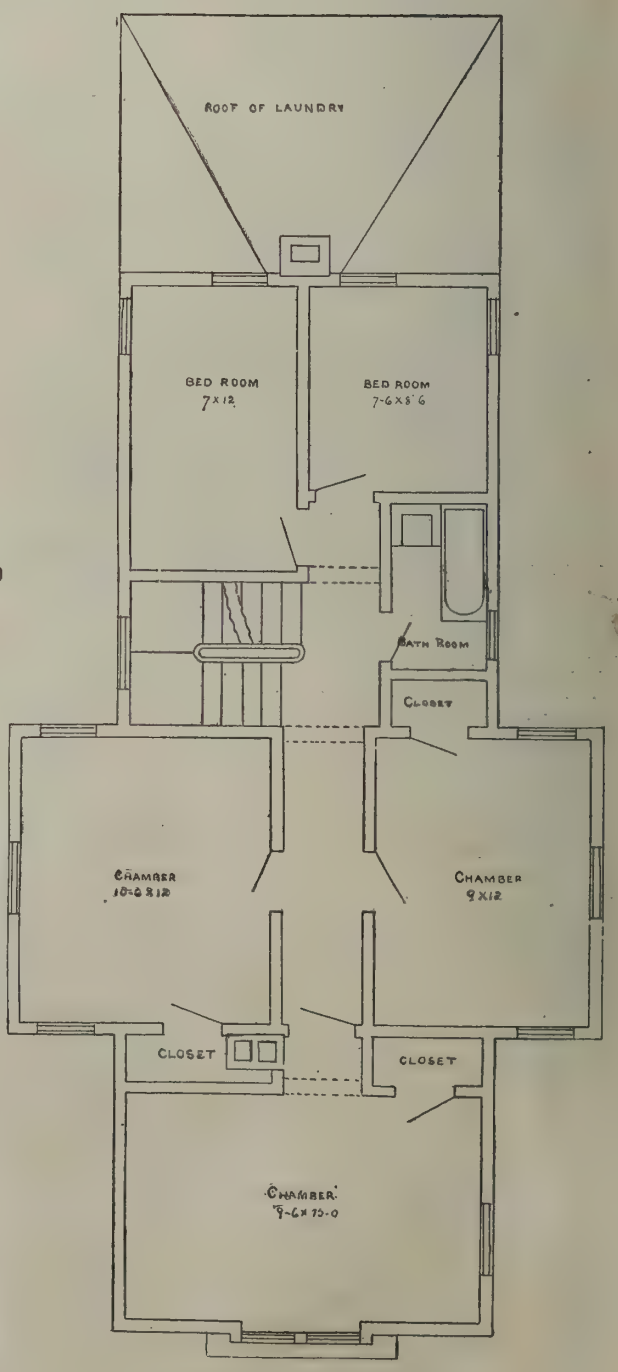
New York.

[For description see page 59.]

FRONT ELEVATION.



FIRST FLOOR PLAN.

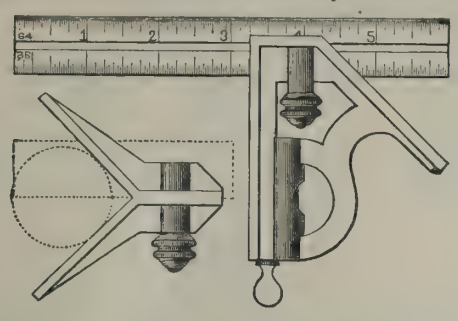


SECOND FLOOR PLAN.

Scale, one-eighth inch to one foot.

STARRETT'S PATENT COMBINATION SQUARE.

With the adjustable scale this forms one of the most convenient and useful tools devised for the use of carpenters and mechanics. One is a complete substitute for a whole set of common try squares, and is one of the best gauges for transferring exact measurement or laying out work. It is also convenient for a depth gauge or to square in a mortise. For a miter it is perfect, while with the auxiliary center-head it forms a centering square, both inside and outside, which is unequaled for convenience and accuracy. L. S. Starrett,



of Athol, Mass., is the manufacturer, and will be pleased to send his catalogue and price list of fine tools for carpenters and machinists on application.

WOMEN OUT OF DOORS.

It is thirty years and more since Thomas Wentworth Higginson wrote his famous essay on "Saints and their Bodies." It struck a new note. Before that time, the intellect and the soul had been cultivated. Learning, philanthropy, and religion were of consequence. To cultivate the body might be well enough for pugilists and circus riders, but was unworthy the serious thought of refined men and women.

Colonel Higginson's essay is to-day the keynote of a grand chorus in which men and women throughout the civilized world unite with ever-growing enthusiasm. Health is now the fashion. To cultivate the body is counted as essential to the best development as to fill the mind with learning. Every college has its gymnasium, every girls' school its regular system of exercise. Colonel Higginson is himself the president of the greatest 'cycle club in America, and in Boston a noble building for a ladies' gymnasium has just been dedicated under the auspices of the best society.

During the past five years a great advance has been made by the women of this country in the direction of physical culture. It is no longer counted unwomanly to use the same care in promoting health and vigor by intelligent exercise that one would use in developing literary taste or artistic skill by appropriate culture. The effect of this change is already seen in the growing strength of young women and their satisfaction in the ability to do things that would have crushed the belle of twenty years ago. Lawn tennis, rowing, horseback riding, tricycling, walking, and regular gymnastic training are in varying degrees popular among the women of to-day. They are found to be not only delightful in themselves, but of direct value in promoting health, strength, beauty, and happiness.

Among these, the tricycle is already recognized as the most useful and enjoyable means of bringing women into the open air and into contact with the attractions of nature. It is safe to say that five years ago there were not a score of lady 'cyclers in this country. Even in Europe there were few. To-day they are numbered by thousands, and hundreds of refined and cultured ladies are joining the ranks of riders every season.

The invention of the tricycle, and its rapid advance to the present state of mechanical perfection, is, I am firmly persuaded, the greatest boon to American women that the century has brought. Coming simultaneously with the conviction that "bodily exercise profiteth" much for womankind, it provides a way to take that exercise which is at once fascinating, graceful, invigorating, and healthful.

The tricycle is in the first place an economical vehicle. Its original cost is about the same as that of a very ordinary horse; but once bought and paid for, its expense of operation and keeping in order is almost nothing. Its diet is oil, its shoeing needs to be done say once in every twenty thousand miles, its repairs—if the machine is a good one—are trifling, and its daily care is not so great as that of a pet poodle. The machine may be kept in a front hall, a cellar, or a barn. It is always ready, by night or day. A chain and padlock will securely fasten it at the house of a friend, the market, or the church.

In the second place, it is mechanically adapted to afford the best possible exercise at the smallest expenditure of fatigue and nervous energy. The lady who mounts a tricycle with pedals and handles properly adjusted will be nearly erect on the pedals, and will use feet and legs very much as in rapid walking. At the same time the shoulders are thrown back, the lungs expanded, and through the action of the arms and the muscles of the back, the whole system receives constant but not exhausting exercise. The deep breathing that is a necessity for the tricycler is of great value to women in developing the strength of their lungs and the faculty of continued exertion. The whole body is more thoroughly exercised in riding a tricycle than in any form of exercise which I have ever tried, and yet so perfectly adapted to human needs is it that the fatigue of a ten mile ride is less than one would experience in walking a tenth of the distance.

There is a fragile woman in a neighboring city, who could not bear a carriage drive of half an hour without being prostrated with weariness. Her husband rode home one day a tricycle, in the faint hope that it might be of use to her. She rode a mile at the first trial, and came home refreshed. The machine was purchased, and I have known her to ride a dozen miles in a hot July day, with pleasure and advantage, when a walk of forty rods would formerly have exhausted her strength. She has been riding now for two seasons, is greatly benefited by it, and is making extensive plans for using a tandem tricycle with her husband, next summer.

The tricyle is unique, as far as I am aware, in that it affords the most thorough and pervasive exercise of all parts of the body, at the same time that the mind is so fully occupied with the care of managing the machine and enjoying the feast which nature spreads on every side, that one is conscious only of the pleasure, and gets the exercise as it were gratuitously. A ride over a pleasant country road in the early morning hours of a June day is an experience of rare delight. With a congenial companion the enjoyment is doubled. The fragrance of the woods and fields, the music of the birds, the exhilarating sense of rapid motion through the soft air, the free bodily movements, in which the tricycle seems only an added physical faculty, all go to make up an experience that, having once enjoyed, one is eager for a thousand times again.

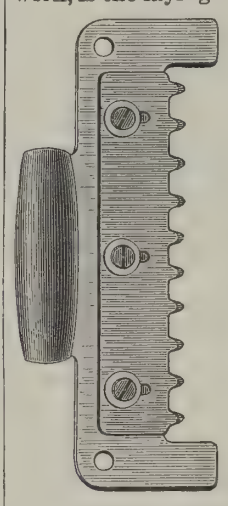
The practicality of the tricycle as a vehicle for the daily use of women is undoubted. There is scarcely a large town in the land where there are not some ladies who use the tricycle as others do their horse and carriage. It is always ready at the door for an errand to the market, a call on a friend, a spin for pleasure, or a journey to the next town. And where is the horse that, driven by his mistress, can be counted on for a uniform speed of eight miles an hour, with possibilities of ten or twelve on fine roads? The absolute independence which the woman with a tricycle has of mankind in every form, from the stable boy to her husband, is peculiarly gratifying to those who have always been compelled to wait the pleasure or convenience of the sterner sex.

The last two years has greatly developed the tandem tricycle in this country, which until that time was almost wholly used in England and on the Continent Very good machines are now made on this side of the water, and their use is rapidly increasing here. The special advantage of the tandem is that it affords pleasant conveyance for a gentleman and lady, or two gentlemen, giving each equal use of the strength of both in propelling the machine. A husband whose wife is fragile and delicate may ride with her on a tandem, using his own superior strength to supplement her weakness in imparting an enjoyable rate of speed, which would be impossible for her on a single machine. The tandem is a social vehicle, and for touring is used with great pleasure and advantage. An easy rate of speed for a well made tandem tricycle is eight miles an hour, and it is not uncommon for a gentleman and his wife who live near my home to take an evening spin of two or three hours at the rate of twelve miles an hour. The touring in Italy and England of Mr. and Mrs. Joseph Pennell, on a tandem tricycle, has borne fruit in two of the most delightfully written and illustrated books of travel which have lately been published.

I have avoided in this brief paper giving figures, dates, and statistics concerning the use of the tricycle by women. They are accessible by every one who cares to know exactly what has been done. Any 'cycle maker or dealer will gladly supply such information on application. I have only amplified and illustrated the undoubted facts of the wonderful growth of the belief in physical culture among American women, and the unique adaptation of the tricycle, in its single or double form, for the promotion of that end in a manner at once pleasant, practical, and popular.—*William B. Howland.*

STANLEY'S ADJUSTABLE CLAPBOARD MARKER.

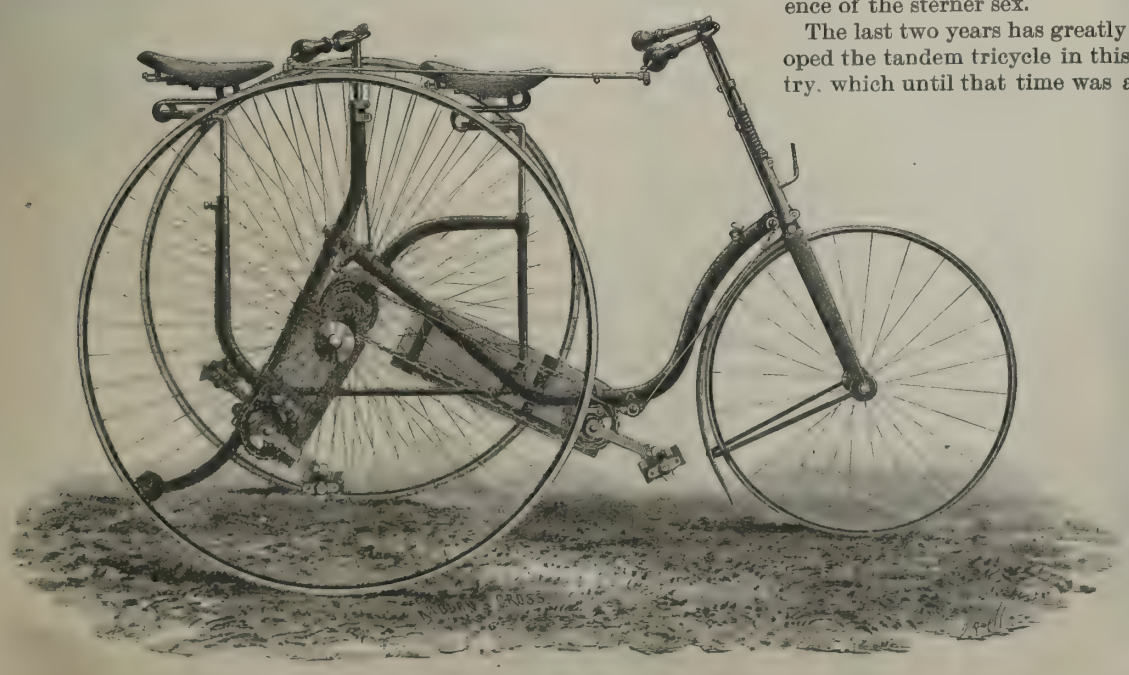
A very considerable part of an ordinary carpenter's work, is the laying of clapboards or siding. A difficult feature in this work has been the fitting of clapboards closely where they end, at the corner board or at window casings. The usual methods employed by workmen for marking and sawing off the boards, by use of a try-square and scrach-awl, or by aid of a clapboard-hook and scratch-awl, have demanded about one more hand than the average man has been supplied with by nature.



We illustrate on this page a tool which can be used with one hand, while the other is employed in holding a clapboard in position. The sharp edge of the teeth on the marking blade are just parallel with the outer edges of the legs when placed against the corner-board; and by moving the tool half an inch, it will mark a full line across the clapboard, exactly over and conformed to the edge of the corner-board or casing. There is then no difficulty in sawing for a perfectly close joint. The Stanley Rlue and Level Company, of New Britain, Conn., are just now supplying hardware dealers with this excellent tool.

Impermeable Boxes.

Excellent water, air, and grease proof boxes can be easily made by immersing either paper, willow, or turned wood boxes in hot melted hard paraffin. Such boxes are very handy and useful for sending out ointments, pastes, pills, or anything of a hygroscopic or deliquescent character. They can be hermetically sealed by placing the lid on the box while warm. Mr. A. W. Gerrard, F.C.S., of University College Hospital, who communicates this note to the *Chemist and Druggist*, sends a specimen impermeable box. The appearance of the wood is little altered by the paraffin coating, and the box is perfectly water tight. Paraffin of high melting point should be used.



LADY'S AND GENTLEMAN'S TANDEM.

THE LADY'S TRICYCLE.

NEW METAL SHINGLES.

One of the most simple and effective means of adding to the appearance of those buildings in which the roof forms a conspicuous feature is to cover it in with

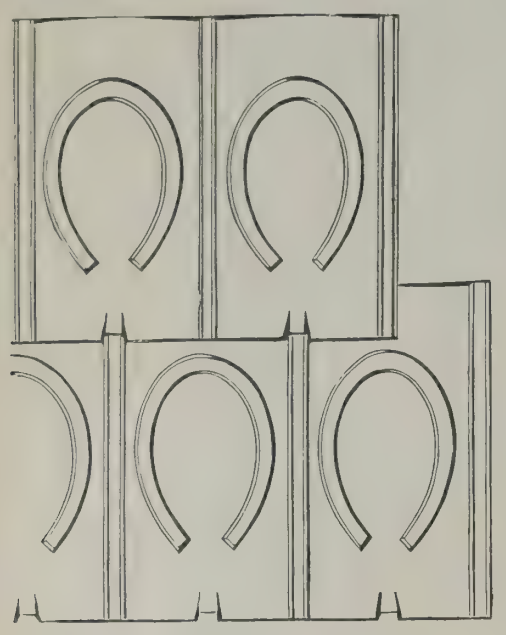


Fig. 1.

a material shaped to form some description of ornament. With this object are shingles and slates, having rounded or semi-octagonal ends, used to add to the effect.

The Thorn Shingle and Ornament Company, of 1201 Callowhill Street, Philadelphia, Pa., are the manufacturers of a variety of different shingles formed of sheet

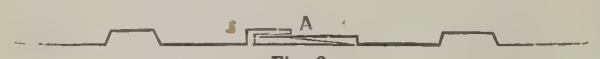


Fig. 2.

metal, which are very useful in giving a decidedly good appearance to the roof upon which they may be placed. One variety we show in the plate at Fig. 1, which indicates the manner in which they are laid upon the roof, and the general appearance they present. They are not inappropriately termed "The Horseshoe Spring Lock Shingle," from the shape of the figure embossed upon them and the description of the lock joint between adjacent shingles.

In all kinds of sheet metal shingles, the importance of the side joints being formed in such a manner as to entirely keep out the weather is great. As they are not laid doubly overlapping, as are slates and the ordinary wooden shingles, any admittance of water through the joints means a probable penetration into the building.

The diagram shown in Fig. 2 indicates the manner in which this is effected by the spring lock. At A is formed a double groove, and, in addition, the edge of the sheet is turned over nearly upon itself, forming a spring edge pressing in an upward direction well against the other edge of the shingle, which enters the before mentioned double groove This system is found very effective in producing a water tight joint, and, at the same time, it is so simple that the shingles may be most expeditiously laid.

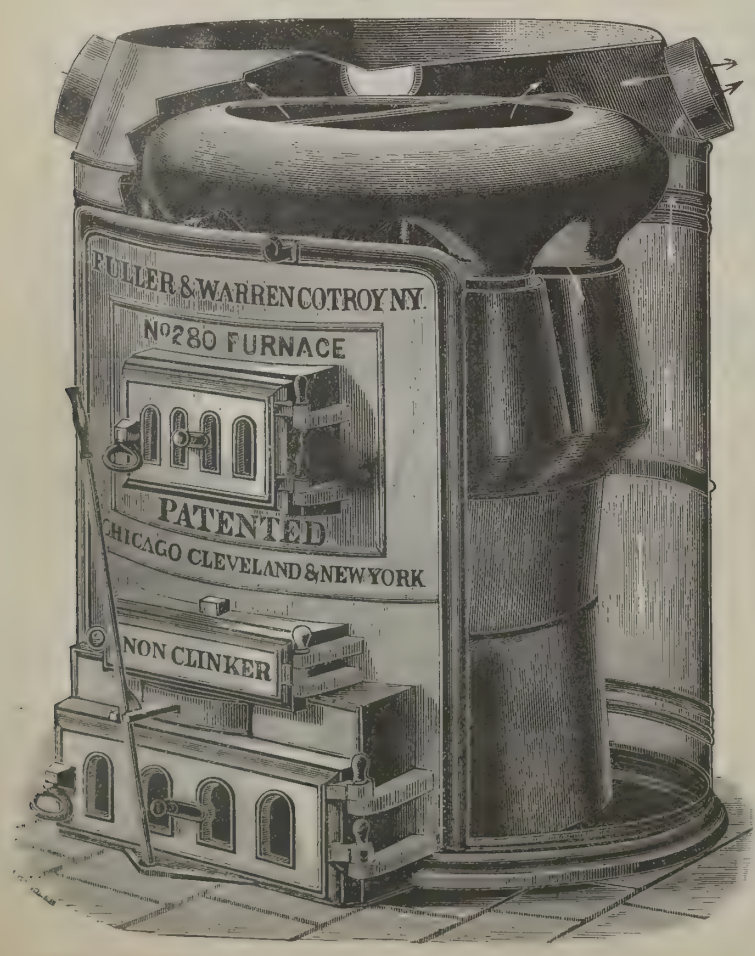
Among the other designs of shingles turned out by the same company are those having hexagonal, lozenge shapes, and other forms embossed upon them. They are made in various sizes, are supplied either painted or unpainted as may be required, and are usually shipped in boxes containing sufficient to cover one square.

By writing to the Thorn Company, those of our readers who are interested may obtain a useful catalogue illustrating the various designs.

FURNACE HEATING FOR HOUSES.

The Fuller & Warren Company, of Troy, N. Y., with stores at New York, Chicago, and Cleveland, Ohio, has long held a leading position among manufacturers of stoves and heaters. In fact, the business of which this firm is the direct successor was founded more than half a century ago, and its managers have, for the long period since that time, been continuously in the front rank in introducing the improvements which have been steadily brought forward by inventors and experimenters for the advancement of this industry.

Among the specialties made by this firm that are particularly worth noting by house builders and architects are their top return flue heating and ventilating furnaces, constructed upon thoroughly scientific principles, and embodying the results of their long experience. The manufacturing facilities of the firm are such that excellence of workmanship has long been a distinguishing characteristic of their goods, a feature which is well exemplified in these furnaces, and which not only insures their durability, but is, in connection with their correct design, promotive of exceptional economy in their consumption of fuel. One of these furnaces is illustrated in the accompanying engraving. It is claimed to be absolutely gas tight, and to have fewer joints than any cast iron heater made, giving a complete control of the fire and a perfect combustion of the gases. In making the various parts of this furnace, the expansion and contraction of the metal at various degrees of heat have been so carefully calculated that the fire has the same effect over all parts, whether at a high or low temperature, and all exposed joints are protected by packing with a cement of their own manufacture, which becomes, after a time, a part of the iron itself.



TOP RETURN FLUE HEATING AND VENTILATING FURNACE.

This furnace is self-cleaning, care having been taken that there shall be no angles to accumulate ashes or soot, and the grate is made with a slide center, by which it can be thoroughly cleaned without opening the door. The dust flue connects directly with the exit pipe, and has an automatic slide that acts in connection with the anti clinker door, which, when open, draws the dust flue slide, and closes it again when the door is shut. Direct draught can be had when desired. The ash pit is of unusual capacity, and the flues are so arranged that all parts of the furnace in contact with the fire are heated thoroughly and alike, and the products of combustion as entirely utilized before passing to the exit flue. There is a damper in the ash-pit door, insuring complete control of the fire; the admission of air under the fire and through perforations in the feed door, the openings in the grate, and the size and shape of the combustion chamber, fire-pot, radiator, and flues being all carefully graduated to insure perfect combustion, and in accordance with a knowledge of the laws governing the principles of heating by warm air. Careful attention has been given to the height of the furnace, to accommodate cellars with low ceilings, and also to insure proper elevation for warm air pipes; and during the spring and fall months, when very little heat is required, it can be easily obtained at a very moderate expense with this heater.

JOINT FOR WOODWORK.

The Tagg system of jointing woodwork consists essentially in soaking a long strip of canvas, or similar fibrous material, and lengths of spun cotton yarn, in a particular kind of vegetable gum, to form the material of

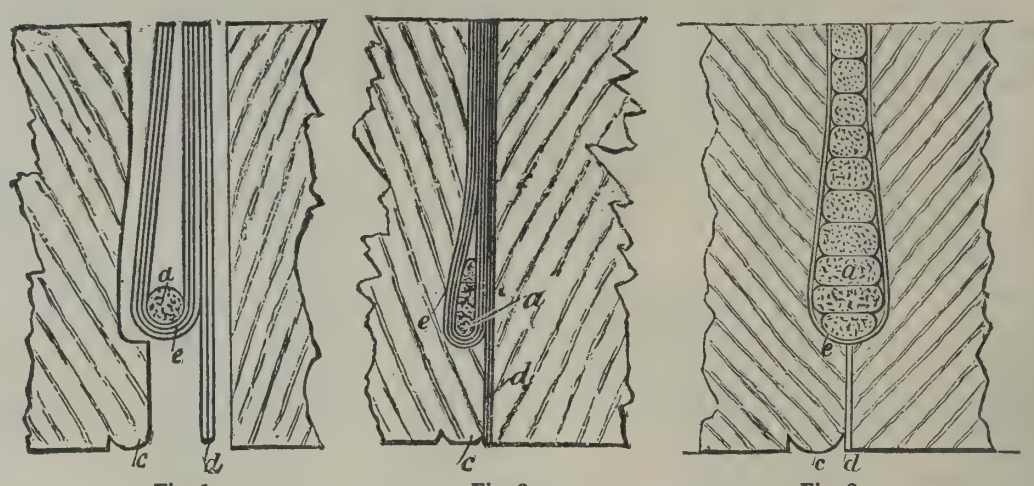


Fig. 1. Fig. 2. Fig. 3.

TAGG'S JOINTS FOR WOODWORK.

the joint. The strips are folded up into as many plies as may be necesssary, according to the depth of the joint, then applied to one edge and held there while the other plank is pushed up and nailed down.

Figs. 1 and 2 show the various members of a deck joint, respectively before and after the joint is made. One plank has a plain edge, the opposite plank has a longitudinal cavity and a closing bead, *c*. The plies of canvas, *e*, have been previously saturated, and receive in their bight a saturated core, *a*. One two-ply length of canvas, *d*, completes the material of the joint. No special devices are required for closing up the planks; they are laid in the ordinary way. For thin decks the core, *a*, is dispensed with, and both plank edges are plain, there being the same number of layers of canvas for the whole depth of the joint.

Fig. 3 illustrates another type of joint, the bulk of the jointing material being saturated cores instead of strips. This type of joint is peculiarly well adapted for remaking old seams without disturbing the planks. No calking is required, and no calking tool is used. Consequently the edges of the timbers are not injured, but are left as sharp as when they came from the planer. The cores of Fig. 3 are rolled into the trough between the two planks by means of a roller with a serrated edge.

There is no exudation of the gum upward. The closing strip, *c*, prevents any droppings, and the lines of the jointing are scarcely perceptible.

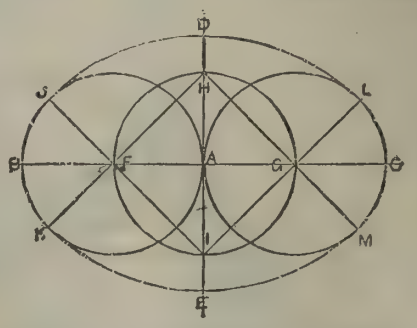
The material of the Tagg joint, says *Engineering*, gives and takes with the shrinking and swelling of the planks through the whole depth of the joint, without separating from the edges, for the canvas strip adheres to the plank edge so closely after the gum has dried that it will resist a straight pull of 41b. per square inch.

This joint has been tried on the decks of the steamship Glengarry for the double trip to China and home again, *via* the Suez Canal, and stood the severe test of the intense heat of the Red Sea thoroughly well. Samples from the Glengarry can be seen at Lloyd's, 2 White Lion Court, Cornhill, E. C.

This invention is applicable to many other purposes besides decks and other parts of ships, and can be used with advantage in many forms of constructional work. The process of manufacture can be seen at the inventor's, Island Boat Building Works, East Molesey.

EASY METHOD OF MAKING AN ELLIPSE.

At the point, A, let two straight lines, B C and D E, cross each other at right angles. From the center, A,



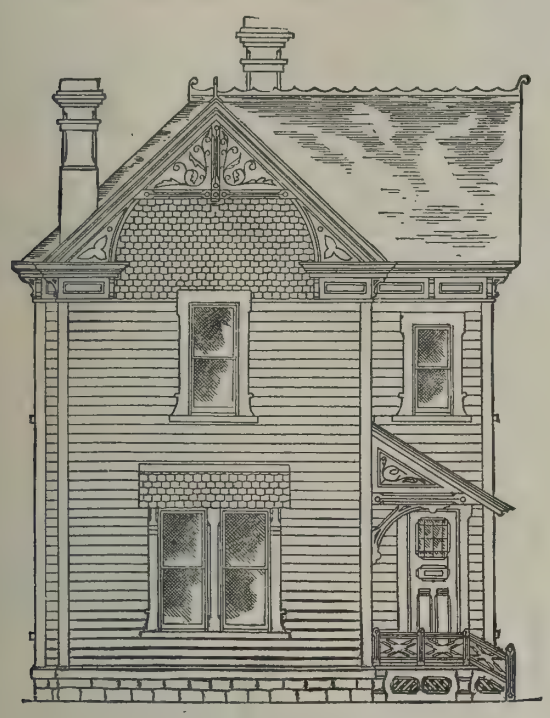
draw a circle, F G H I; and from F and G draw two other circles of the same circumference as F G H I.

From the points H and I draw four straight lines through the points F and G to the points J, K, L, and M. Then from the centers, H and I, draw the arcs, J D L and K E M.

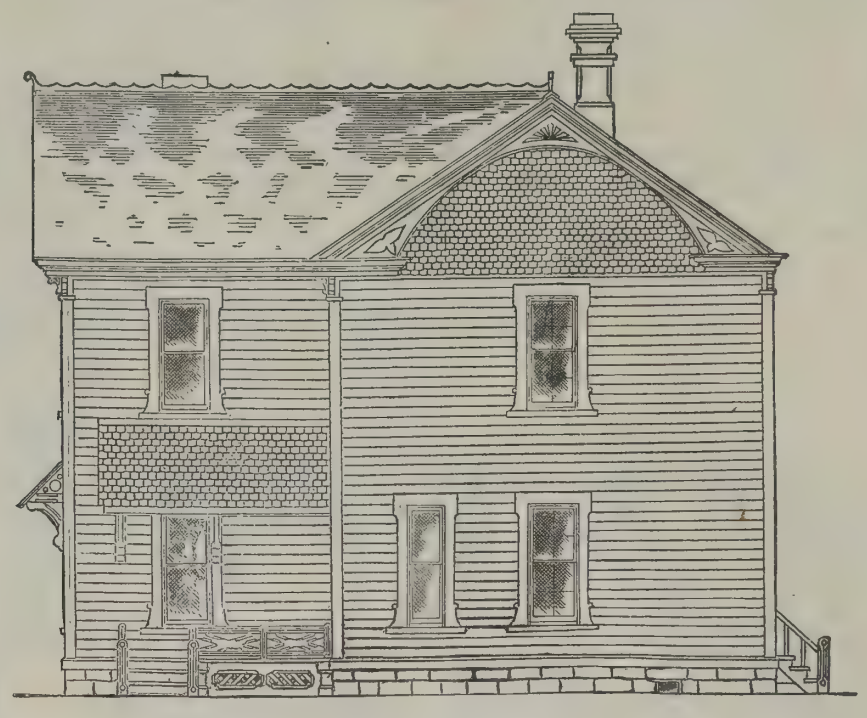
An ellipse of any size may be produced by making the diameter of the first circle half the length of the desired ellipse.—*H. C. Crew, English Mechanic.*

A ONE THOUSAND DOLLAR COTTAGE.

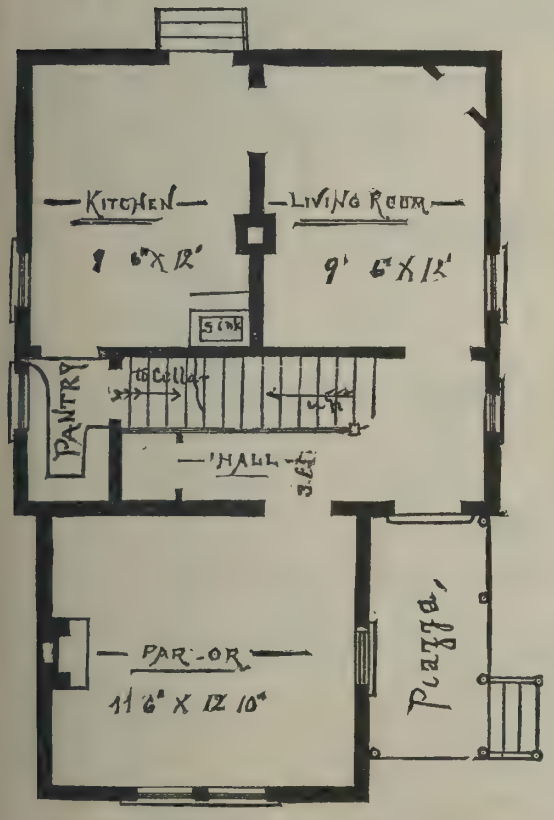
The cost of erecting this house, according to the estimate of the author of the plan, Mr. G. Goldstone, of Toronto, Canada, is only $997.35; and as the rooms are of modest dimensions (though sufficient for the needs of a small family), and the ceilings of the first and second stories respectively 8¼ and 8 feet high, the design can no doubt be carried out for that sum. With some latitude in point of finish and quality of material and work, however, it might easily cost $1,200, and we should be inclined to place the estimate at that figure for a thoroughly satisfactory job. This view of the case is especially suggested by the fact that the general design of the house, as shown by the elevations, is of a somewhat decorative character; and to be in keeping with its tasteful exterior, some liberty should be allowed in the inside work beyond what mere necessity is built of field stone, or bowlders, laid in random courses pointed with dark cement mortar. The house above the foundation is of wood, and the exterior is entirely covered with shingles. On the first floor there is a large hall running through the house, with a square staircase at the end lighted by a large stained glass window. The hall contains also an open fireplace and wide doors entering a living room on the left 14′ × 16′, and dining room on the right 14′ × 17′, each having a fireplace. From the hall the kitchen is also reached, which is 12′ 6″ × 14′, with a pantry between dining room and same, and a summer kitchen, etc., in the rear. The second floor contains three large chambers; bath-room and servants' quarters over kitchen and pantry, etc. The main staircase stops on second floor. The private staircase starting in kitchen continues up to attic, which contains a bed room, tank room, and tower room. The roof is painted a light brick or tile color, the shingles on sides a light yellow buff, with a darker trim color for cornices and string mouldings; black sash. The cost of the building is about $4,000 complete.—*Building.*



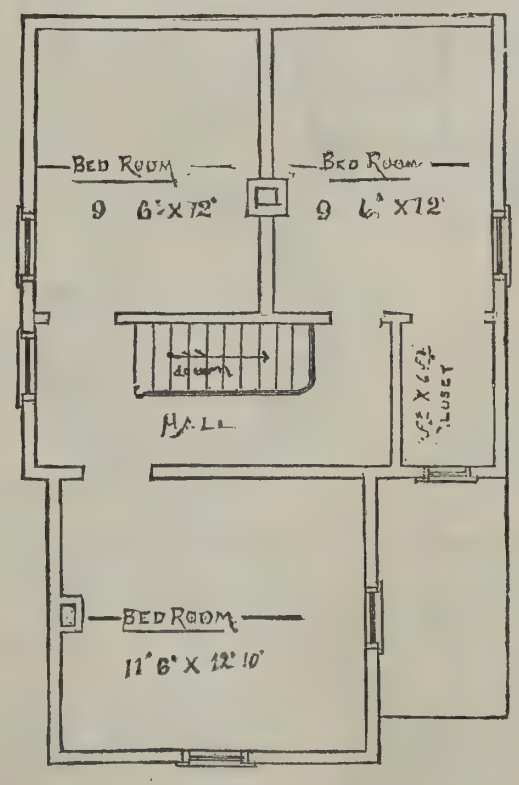
FRONT ELEVATION.



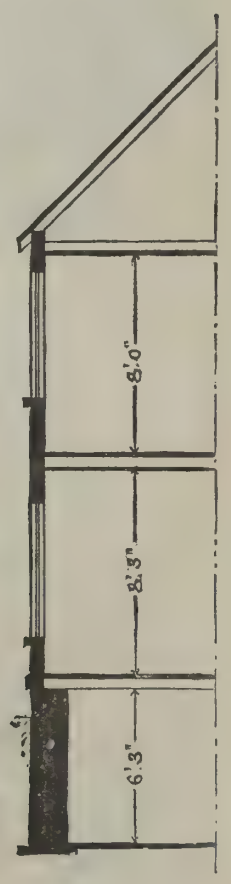
SIDE ELEVATION.



First Floor Plan



Second Floor Plan



A ONE THOUSAND DOLLAR COTTAGE.

would require. If, however, absolute plainness in the finish be adhered to, the house can be built for the amount named by the author of the plan, and in some parts of the United States for even less.

A suburban lot of 25 feet front is quite sufficient for a house on this plan, and where lots are procurable for $10 to $20 per front foot, an attractive home may thus be made at a cost not exceeding $1,500 to $1,800.—*Mechanical News.*

A DELAWARE COUNTRY RESIDENCE.

Residence for George D. Wetherill, Esq., Clear View Farm, Delaware. Hazlehurst & Huckel, architects, 508 Walnut Street, Philadelphia.

This cottage is built about twenty-five miles from Philadelphia. It stands on a slope of a hill commanding a view up the Delaware River and surrounding country for twenty miles. Above the natural grade, which has been but slightly changed, the foundation

Impure Ice as a Cause of Disease.

The State Board of Health having been asked by the Board of Health of Syracuse to examine into the purity of ice taken from Onondaga Lake, from the Erie Canal at Syracuse, and from Cazenovia Lake, has not only made a careful investigation into the quality of ice from those sources, but has also prepared a report on the general question of the pathogenetic powers of contaminated ice. The board comes to these conclusions: Ice formed in impure water has caused sickness; it may contain from eight to ten per cent of the organic matter dissolved in the water, and, in addition, a very large amount of the organic matter that had been merely suspended or floating in it; it may contain living animals and plants, ranging in size from visible worms down to the minutest spores, and the vitality of these organisms may be unaffected by freezing.

Analyzed the Ashes.

Two barns said to be filled with unthrashed wheat were recently burned in Germany. They were insured, but it was impossible to collect, because the claim was made that the contents of the barns were simply straw. When the affair got into the courts, chemical experts were called to analyze the ashes. Wheat contains a large quantity of phosphoric acid, almost ten times as much as does straw. Naturally, in the burning of these barns, wood ashes, cement, and other mineral substances were mixed with the ashes submitted to the chemists, but none of these admixtures contains phosphoric acid. The experts found that of two samples placed in their hands, one contained 10·2 per cent and the other 19 per cent of the acid, thus proving conclusively that the farmers were in the right, and the insurance companies, as is generally the case, according to public sentiment, in the wrong.—*Fireman's Herald.*

A SUBTERRANEAN water collecting dam has been patented by Mr. David H. Valentine, of Brooklyn, N. Y. The dam is combined with a conduit upon its source side, the dam and conduit being built from a central point or reservoir in a valley, up an elevation or hillside, and serving to intercept the earth flow of spring water through gravelly soil to the ocean or any watercourse.

REMODELING A HOUSE.

It frequently happens in the experience of the architect that he is called upon to enlarge or remodel a dwelling. Sometimes it is only required to add one or more rooms, while in other cases it is sought to improve the appearance of the exterior. Such problems often severely tax his ingenuity, for it becomes difficult to considerably improve the appearance of a building while substantially maintaining its original outlines.

As illustrating what may be done in this direction, we present to our readers a set of drawings, showing the ingenious and clever method of treatment adopted by Architect Howard Hoppin in dealing with the residence of Mrs. R. M. Clark, at Pomfret, Conn. This house before alteration presented the appearance of a comfortable, plain, country dwelling, as represented in the view in the upper right hand corner of our plate. The imposing appearance of it as it now stands can be seen from the large perspective view.

The alterations, although apparently so extensive, were, in fact, few beyond the addition of towers, the stone lining to some of the walls, and the new piazza. Scarcely a feature of the original house has been removed. It has simply been added to, and this in such a manner as to throw but little weight upon the old work.

We show a number of details of the construction, and give below a complete specification of the work, which cost about $7,000 to carry out. Mr. Hoppin's address is 33 Westminster Street, Providence, R. I.

ALTERATIONS AND ADDITIONS TO A COUNTRY HOUSE AT POMFRET, CONN.—HOWARD HOPPIN, ARCHITECT.

MASON'S WORK.

Excavate and remove to place shown on lot all soil for air space under tower, for trenches, for all new walls, chimneys, piers, and foundations, as shown. Trenches for tower and stone walls at L to be dug below cellar bottom. Trenches for new porch and foundations, outside of walls, to be dug 4 ft. below grade.

Footings.—Bed on solid bottom, good footing stones under all walls, piers, and chimneys.

Foundation Walls.—To be of stone under all walls, piers, and chimneys, laid in lime mortar, pointed up on outside.

Repairing Old Cella Walls.—Take down old cellar walls where unsound or unsafe, and rebuild like other walls. Jack up house where sagged, and finish all securely. Point up old cellar walls where repaired, and leave in good order like other old walls. New foundation walls, outside, to run from footings to six inches below grade. Upon said foundations, 6 in. below grade, build stone walls of sizes, shapes, and dimensions shown. Said walls to show a rough random rock face, and to be carefully laid in lime mortar, and pointed up with sunk joints of cement—half and half mortar—at end of job. Stone walls of porch and piazza columns to be dressed off with hammer to curves as shown. Reset stone step at porch, with good solid foundation under.

Sills.—Set all stone sills.

Lintel Arches.—Turn lintel arches over windows of tower. All stone for building to be supplied by owner. The contractor to dress and set same in best manner. Build stone bases for piazza columns, as and where shown, from 4 ft. below grade to base of wooden columns, with batter all around, and corners dressed off to round.

Chimneys.—Build new chimneys in tower, of good hard body brick from foundations to under side of roofs or connections with piping as shown. To be brought up through small tower to ceiling of third story, each floor to be fitted to round 10 in. tile pipe with easy bends; from said bends run up lines of 10 in. tile pipe with incline of roof, to and through copper tower top.

Fireplaces.—Build three fireplaces in tower as shown, of good hard body brick, laid in red mortar.

Flues.—All tower flues to be 8 in. by 12 in., and parged from top to bottom. All new chimneys where not surrounded by stonework to be plastered on outside from top to bottom. In second story bed-room over hall to corbel out and to build brick backing in corner as shown, 5 ft. high from floor, with 6 in. tile from face of same to flue, 4 ft. from floor.

Trimmer Arches.—To be buried under all tower fireplaces.

Hearths.—To be of hard body brick to all fireplaces of tower.

Lead Flashing.—Of 4 lb. lead on all chimneys where coming through roofs.

Note.—Carpenter is to furr all stone walls and all ceilings.

Lathing.—To lath walls and ceilings of whole of tower, and other parts of house where required. All laths to be of good spruce 4 feet long, and securely nailed.

Plastering.—Plaster the whole of the above, and patch up through whole of house all cracks and broken places. First coat to be a good thick coat of hair mortar. Finishing coat of lime, putty, and plaster of Paris. All plaster to be slaked for a week before using.

Outside Plastering.—Upon wire netting, supplied and put on by carpenter, put a heavy coat of stucco (half lime and half Portland cement) well pressed into spaces of netting. Before this coat is set, press in bottle ends, glass, pebbles, etc., as directed. Glass, etc., will be furnished by owner.

CARPENTER'S WORK.

Timber.—To be of good, sound quality, of sizes as follows: Tower floor joists, 2 in. by 9 in. (16 in. on centers); porch floor joists, 2 in. by 9 in. (16 in. on centers); porch ceiling joists, 2 in. by 9 in.; tower ceiling joists, 2 in. by 10 in. and 6 in. by 10 in., as shown, alternating, 6 in. by 10 in. joists to be of hard pine, others to be of spruce; tower rafters, 2 in. by 10 in. (24 in. on centers); small towers and dormer rafters, 2 in. by 6 in. (24 in. on centers); L roof rafters, 2 in. by 9 in. (24 in. on centers); sills, 4 in. by 6 in.; sill at top of main tower, 4 in. by 6 in.; posts, 4 in. by 6 in.; plates, 4 in. by 4 in.; studs, 2 in. by 4 in. (16 in. on centers); studs at top of main tower under 6 in. by 10 in. joists to be 4 in. by 6 in hard pine.

Ties.—Across main tower, 1¼ in. by 6 in. spruce.

Crossbridging.—To crossbridge ceiling joists of third story tower room with 2 in. by 4 in. crossbridging in three parallel lines, carefully spiked to joists. Crossbridge floor joists of tower in one line across same in center with good spruce scantling.

Cutting and Jobbing.—Do all necessary cutting, fitting, and jobbing for other workmen on the building, and leave space of 2 in. around new chimneys. Stud same, taking care not to drive nails into same.

Cover new roof sides and floors with good ⅞ in. hemlock boarding.

Sheathing Paper.—Before laying upper floors and putting on outside finish, cover boarding of floors and sides with one thickness of sheathing paper overlapping.

Tinning.—Cover roofs of front porch, flat part of south dormer, and new roof over entry to tower in third story with first quality M. F. I. C. terne tin. Also under sides of roof boarding and both sides of rafters, next to tile flue piping on tower, up full length in best manner.

Flashing.—With same tin on all new hips and ridges, valleys, and chimneys, also over all exposed doors and windows, over stool under third story tower windows, and wherever else is necessary.

Shingles.—Cover all new roofs and patch up old roofs where necessary with shingles of same quality as old shingles. Cover sides of building over clapboards with curves of first quality sawed cedar shingles 4½ in. lap.

Clapboarding.—Repair old clapboards where necessary, and leave in good order.

Furring.—Furr out all stone walls and all ceilings where plastering is to be used with good ⅞ in. scantling.

Wire Netting.—Cover outside where outside plastering is to be used with heavy wire netting ⅜ in. mesh.

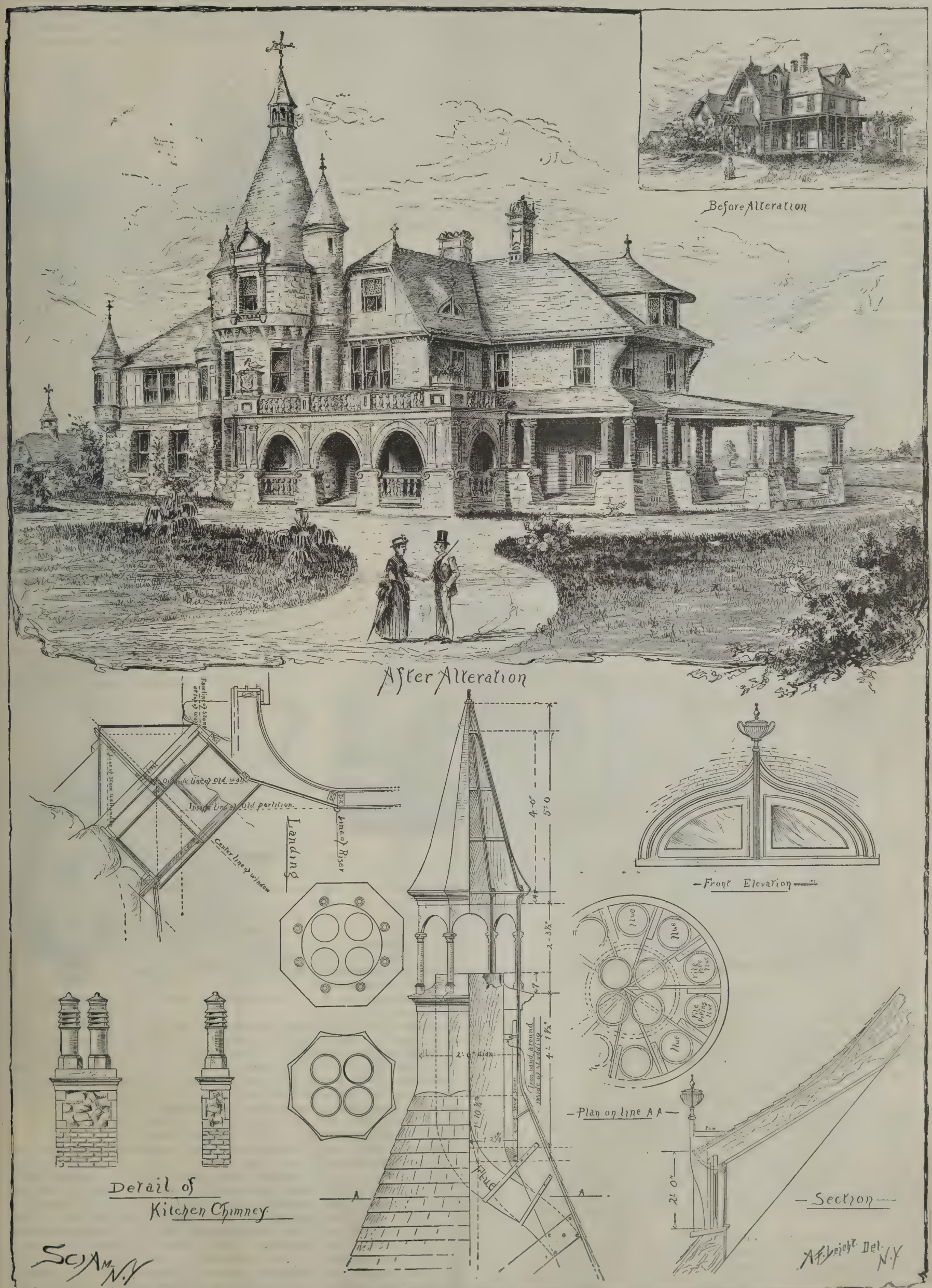
Iron Ties.—Put on iron ties to outside walls which are to be faced with stone, 18 in. apart, both ways.

Gutters.—To frame a gutter around and in jet of main tower, and to line same with first quality tin tied to main roof with strap irons and tin to run 12 in. up roof. Put up wooden gutters like old gutters of house on new roofs to kitchen, with good pitch to outlets, and line with first quality tin.

Conductor Head.—Put good conductor head to tinned roof over entry to third story tower room at front gable end, lined with tin. Look over old gutters and leave all in good working order.

Conductors.—Of 3 in. tin to ground. One line at front gable end, one line by stair-case bay window, and one line at each end of kitchen.

Upper Floors.—Lay upper floors of first quality spruce ⅞ in. thick, matched on floors of main tower and in other parts of new addition. Lay first quality floor of hard pine on porch and connection between porch and



ALTERATIONS AND ADDITIONS TO A COUNTRY HOUSE AT POMFRET, CONN.—HOWARD HOPPIN, ARCHITECT.

piazza as shown. All flooring to be carefully laid and blind nailed.

Frames.—New window and door frames of good white pine on all towers, stair-case hall (two stories), front hall, side windows, and two south dormers, frames and sash of kitchen L to be cut down as necessary.

Sashes.—To be of sizes and shapes as shown, of first quality white pine 1¾ in. thick. Sash of eyebrow dormer to be hung at side with good snap catches on each sash. All other windows to be weighted in best manner.

Glass.—Of first quality, like glass in rest of building.

Doors.—Of sizes and shapes given. Front doors to be repaired and covered on outside with first quality San Domingo mahogany ⅝ in. thick, perfectly plain, without panels or mouldings. Inside of front door not to be changed. Coat closet doors and reception room door to be of ash, like other doors opening into front hall. All other new doors to be of first quality white pine, like other doors of house.

Hardware.—To be like old hardware.

Finials.—Put up eight finials to roofs, and allow $50 for cost of same.

Dormers.—Take off north and south (front) dormers entirely, and put south (front) dormer on new, and change south dormer, as shown.

Piazza Jet.—Case in piazza jet as per details, with friezes inside and out. Mouldings of same to join flush with string course around house.

Copper Tower Top.—Make and put up a top to tower, as shown, of first quality copper, with floor and ceiling of copper. Floors to turn up over chimney flues, so as to prevent leakage. To be attached to roof, with all necessary irons, bolts, etc.

Outside Finish.—Of first quality white pine. Get out and put on heavy mouldings around casings of windows, etc., where at shingles, stone, or new work. Burr out gable ends and around kitchen L, as shown, with brackets, mouldings, and finish as shown.

Half Timber Work.—At outside, plaster to be of ⅞ in. stock over furring strips, and plaster. Furr out at third story of main tower and on small towers with corbels and mouldings.

Piazza Columns.—To be cut off at new stonework, and to be cased with grooved casings and with caps and bases, as per details. Flat columns to be of 1¼ in. stock, grooved, and with capitals and bases, as shown.

Balustrade.—Over front porch of 1¼ in. stock sawed and chamfered out, and with half turned column on outside. Turn moulded arch at front porch, with carved brackets under. Octagonal bases over columns on front porch to be gotten out, with strong top to hold vase of flowers, top to be covered with tin.

Steps.—Put on nosing to floor of front porch, and piece out piazza with curve and with nosing and base like other parts of piazza. Replace steps to kitchen door in best manner. All woodwork inside of bays and landings of first quality ash.

Sheathing.—Sheathe the overheads of front porch and under overhang of south dormer window with ⅞ in. matched and beaded white pine sheathing with bed mould.

Blind Window.—Frame in blind window in main tower with frame and outside blinds like other windows.

Outside Blinds.—To all new windows, except landing windows and eyebrow dormer, to be like other blinds. Blinds to windows with stone jambs to have long arm hinges, so as to swing back clear from same.

Inside Finish.—All inside finish for house to be of material and like other parts of finish; that in first story front hall of first quality ash.

Closets.—To have 12 double wardrobe hooks.

Picture Mouldings.—Put on 1½ in. picture moulding to second and third stories of tower ¼ in. below ceiling, and 3 in. picture moulding and cap on walls of reception room at ceiling.

Tank.—Build and set a tank in roof of tower of 1¼ in. matched white pine. Same to have four hoops of strap iron 1 in. x ¼ in.

Scuttle.—Build and put up a scuttle in roof of main tower at tank, with cover hung on heavy strap iron hinges. All to be carefully flashed and arranged with ladder on outside, so as easily to get at same.

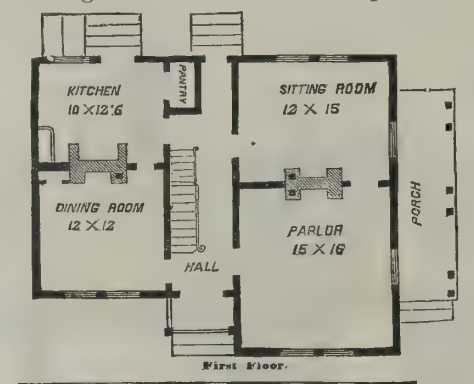
PAINTER'S WORK.

Outside.—Paint all roofs of house with first quality, leaving the whole at end of job clear and even. Give all shingles (except on roofs) one coat of Cabot's creosote stain, of shade selected by architect. Give all clapboards, conductors, gutters, blinds, metal, and outside finish two coats of first quality paint, in such colors as the architect may select. Give ceiling of porch and overhang of south dormer one coat of shellac. Give porch and piazza floors one coat of raw linseed oil.

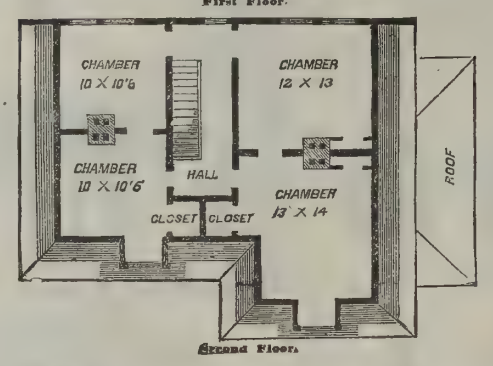
Inside.—Give all ash (and mahogany on front door) one coat of good filler. All ash an extra coat of shellac. Rub down mahogany of front door with pumice stone and oil, and leave same in fine dead finish. Paint woodwork of tower rooms with two coats of first quality paint, in such colors and shades as the architect may select. Owner to do all extra painting inside.

A MANSARD ROOF DWELLING.

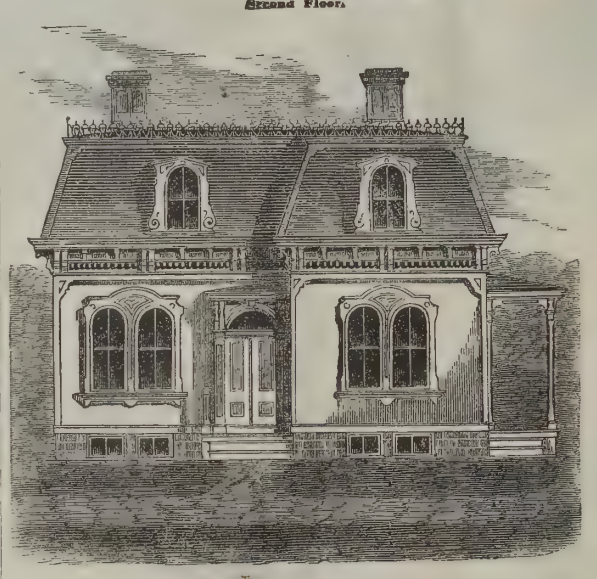
The principal floor of this design is elevated three feet above the surface of the ground, and is approached by the front steps leading to the platform. The height of the first floor is eleven feet, the second ten feet, and the cellar six feet six inches in the clear. The porch is so constructed that it can be put on either the front or side of the house, as it may suit the owner. The rooms, eight in number, are airy and of convenient size. The kitchen has a range, sink, and boiler, and a large closet, to be used as a pantry. The windows leading out to the porch will run to the floor, with heads running into the walls. In the attic the chambers are 10 ft. by 10 ft., 13 ft. by 14 ft., 12 ft. by 13 ft., 10 ft. by 10½ ft., and a hall 6 ft. wide, with large closets and cupboards for each chamber. The building is so constructed that an addition can be made to the rear any time by using the present kitchen as a dining room and building a new kitchen. These plans will prove



First Floor.



Ground Floor.

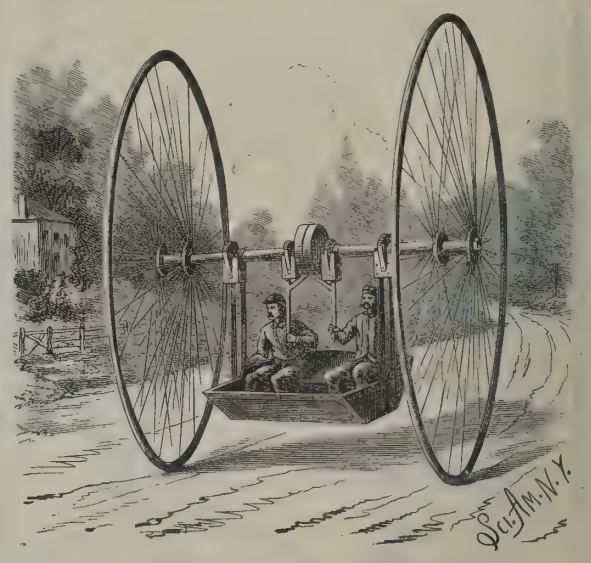

Front Elevation.

suggestive to those contemplating the building of a new house, even if radical changes are made in the accompanying designs.—*American Cultivator.*

SWING BICYCLE.

The bicycle shown in the accompanying engraving is the invention of Mr. Nathaniel Brown, of Emporia, Kans. The wheels are secured to the outer ends of two hollow axles or shafts, which are mounted upon a central shaft, and are formed with ratchet wheels and friction disks. The seat is suspended by means of arms connected to centrally slotted straps passing over the axles; the ratchet wheels pass through the slots in the straps, and are engaged by spring pawls secured to the forward upper ends of the arms. In connection with each of the two other ratchet wheels is arranged a block, held to the hollow shaft by straps, and provided with a spring pawl engaging with the teeth of the ratchet. Pivoted in recesses in the lower ends of the blocks are lever arms, formed with inwardly extending fingers, arranged so that when the arms are swung toward each other upon their pivots, the fingers will be brought to bear against the faces of the friction disks.

The pulling of the levers downward starts the main wheels forward, and at the same time swings the seat forward, thus moving the pawls carried by the arms supporting the seat backward, and bringing them into engagement with teeth upon their ratchets, not so far advanced as were the teeth with which they were primarily engaged. As the levers are moved forward, the swing of the seat toward its normal position will act to advance the bicycle, and by so reciprocating the levers it will be seen that a pendulum motion will be imparted to the seat, which will, when once started, propel the machine for some time. When it is desired to turn the machine, say to the left, extra force is exerted upon the right hand lever, which will tend to drive the right hand wheel forward faster than the other; or the motion of the left hand wheel may be checked by moving the left hand lever so that its finger will bear against the friction disk. To stop the machine, both brakes are applied by moving the levers toward each other. The rider may stop at any

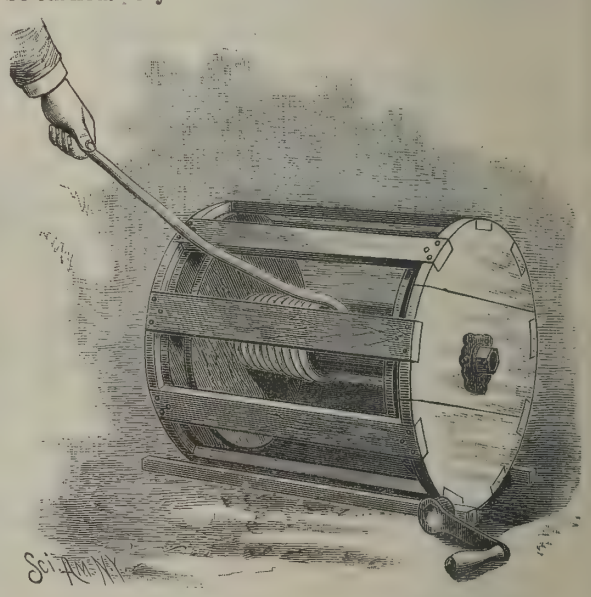

BROWN'S SWING BICYCLE.

desired point, when ascending a grade, and rest at ease, since any tendency of the machine to run backward would be counteracted by the weight of the seat.

IMPROVED LEAD PIPE REEL.

Lead pipe is usually put up on reels which do not have an inclosing case, the heads of the reels being connected by slots, which must be knocked off before the pipe can be unreeled and disposed to customers; and before the reel can be turned, it is necessary to elevate it upon a bar passed through its hollow shaft or body. Like trouble also attends the putting up of the pipe on the reel. These difficulties are obviated in the invention here illustrated, which has been patented by Mr. Fred. Eitapenc, of Oneonta, N. Y. The outer reel case is of circular form, and is made up of opposite heads connected by slats. Within the case is arranged the reel proper, which is provided with two heads, suitably connected together and mounted upon a shaft having bearings in the heads of the case.

One end of the shaft projects sufficiently far to receive a crank handle, by means of which the reel may be turned. By this construction there will be no ne-


EITAPENC'S IMPROVED LEAD PIPE REEL.

cessity of raising the reel from the ground either to coil the pipe upon it or to remove it, while the slats need not be removed, as the pipe can be passed between any two of them. The reel is thus rendered more durable by not having to knock off the slats to pay out the pipe, and the whole is so fitted that it may be readily taken apart when required.

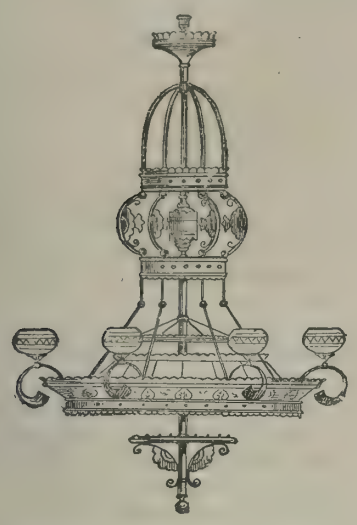
Lime Cartridges.

The cartridges have been found most valuable for work in many kinds of stone, including granite, Portland stone, sandstone, etc., as well as masonry of stone or brickwork. A block of granite weighing about four tons, and embedded on two sides and at the bottom in strong cement, was recently moved easily by two shots. In experiments for the Admiralty at Portland, three shots of lime cartridges got thirty tons of stone in large merchantable pieces. The cartridges were used with great success for upward of twelve months in the formation of the Copenhagen Tunnel, North London, and they are now in use for removing the sandstone in the excavations of the Mersey Tunnel Railway Company, at Liverpool.

FRINK'S PATENT REFLECTOR.

The various reflectors manufactured by I. P. Frink, of 561 Pearl St., New York City, under his patents are now used to a considerable extent throughout the country. They are formed in various shapes, patterns, and sizes for numberless purposes, from a highly polished silver plate which is corrugated on the surface. The effect is to reflect the light in a manner free from an objectionable glare, and to well diffuse it throughout a room.

One of the purposes for which the plate is found eminently useful is for application to the outside of a window which, owing to the construction of the building or from local causes, admits but little light. The reflector is formed in an attractive frame, and being placed at a proper angle, reflects the daylight into a



FRINK'S PATENT REFLECTOR.

room. The advantage in saving gas and preventing injury to the eyesight is very great, and it is astonishing how much light may be obtained by these means.

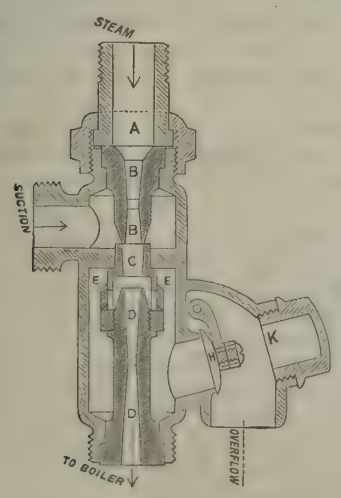
Then the reflectors have been made in an immense variety of kinds for different uses, such as for lamps, gas, oil, and electricity; in fact, from the smallest reflector, costing only a few cents, for a kerosene lamp, up to the magnificent chandeliers used in the principal of our theaters, this reflector has been employed with excellent results. The annexed engraving shows its application to a gas chandelier.

An illustrated catalogue giving full particulars of the material, prices, etc., will be forwarded on request.

PENBERTHY INJECTOR.

At last a mechanical combination and device has been produced, and a man's labor and study crowned with success, in the production, for the convenience of engineers, of a simple and compact device known as the Penberthy injector or boiler feeder.

Its mechanical construction is very simple, but perfect. All its parts are movable and convenient of access (not being screwed in), its working so complete that an inexperienced person can operate it with success and perfectness. Its adaptability to all classes of boilers, such as stationary, portable, traction, marine, and locomotive, and its working on each, makes it very desirable, and recommends it to all classes of engineers. The automatic working of this injector is of very great advantage, as by this mechanical construction it works under all conditions of shakes, jars, and concussions. In



PENBERTHY INJECTOR.

case of a break, or the suction is to be removed and then returned. it picks up or begins working without any aid, assistance, or attention from the engineer, thereby relieving of much care and annoyance. Its convenience of access is of very great consideration and importance, owing to the advantage of cleaning and examining its interior parts.

The working parts of this injector are stationary in their work, thereby causing comparatively no wear in its mechanical parts. The inventor seems to have combined common sense with mechanical science, l leaving out all complications, and combining in t injector every convenience of operating, getting at, and putting it on the boiler.

The body is of a single cylinder or barrel, with two jets inside, "steam and combining," and governed by an automatic swinging overflow. The injector is operated by the opening or closing of the globe valves. It is connected to the boiler and pipes with uniform and interchangeable square centered unions, and can be put on or taken off very quickly without any annoyance or injury, and the only tool required being an ordinary wrench.

Another great point gained in this injector is its great range of working capacity. It will lift water twenty-five feet perpendicular, or take it a hydraulic pressure and force it into the boiler at a temperature of from 140° to 180° Fah. It will work under a steam pressure of from 20 to 140 lb. It will also lift and force water at a very warm temperature (say 120° Fah.) in tank or well, and under all circumstances and at all points it works automatically. The inventor and manufacturers of the Penberthy injector have great confidence in its working qualities, and to satisfy engineers of its merits and perfectness of work, solicit a trial. From observation, a brilliant future is in store for this little wonder of simplicity and compactness, which is a model of mechanism in appearance and finish.

For prices, etc., address Jenkins Bros., 71 John St., New York, 13 So. 4th St., Philadelphia, and 105 Milk St., Boston, agents for this injector.

The kitchen is provided with dresser, range, and sink, and the laundry has stationary tubs. A small sink is placed in pantry connecting dining room and kitchen. From this pantry access is had to the cellar, to which there is also an outside entrance. Bath room is in second story, and contains bath tub, wash basin, and water closet. Hot and cold water through house.

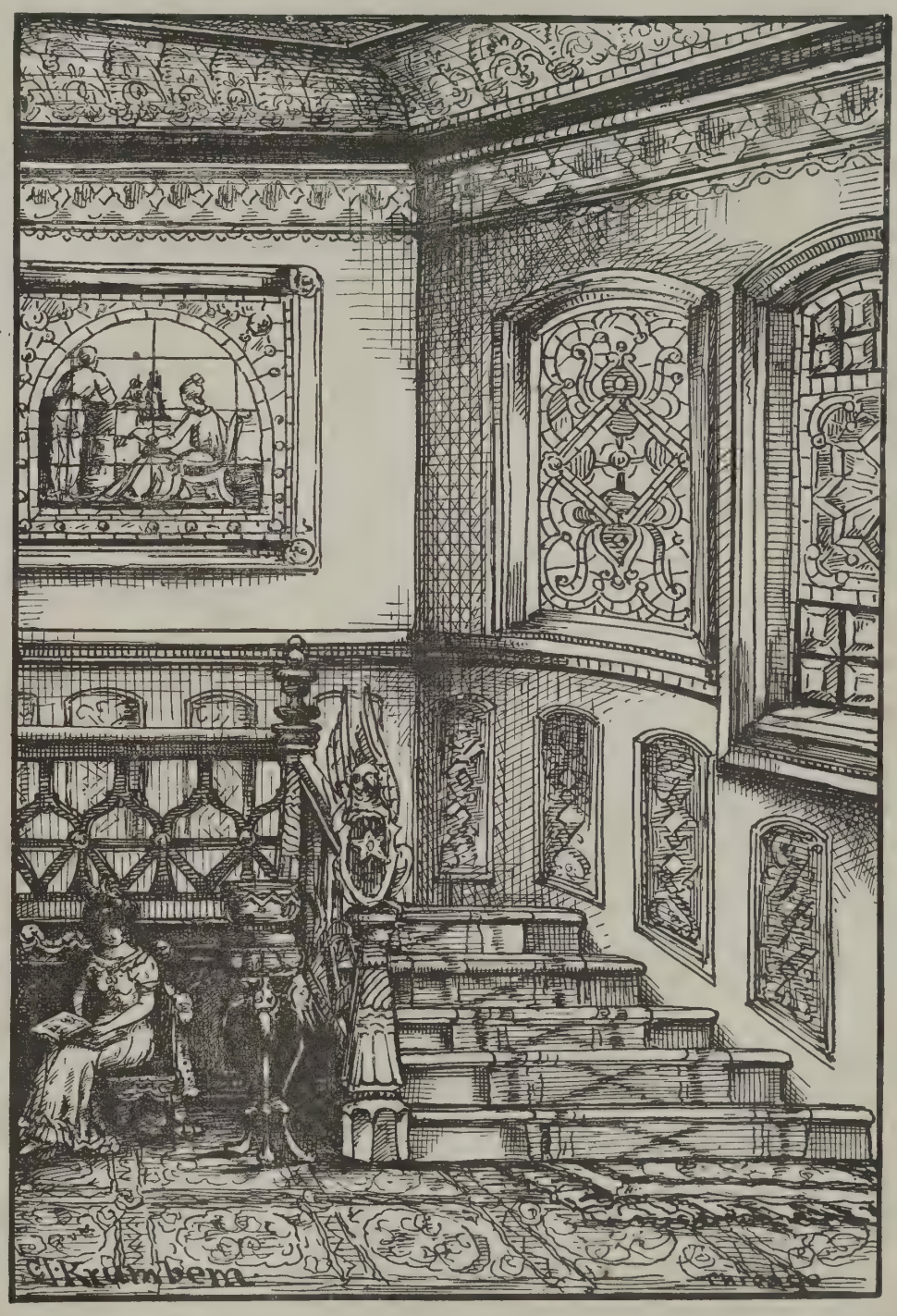
There are in all nine rooms, not including entrance hall and bath room, and the spacious attic can be arranged with one or two good rooms if desired. Cellar extends under entire house. Exterior of house is sheathed, and covered with narrow clapboards, except front gable and a strip between first and second stories, which, with the roofs, are shingled. Cellar walls are of stone.

The estimated cost of this house is twenty-eight hundred dollars.

The architect is Charles G. Jones, 280 Broadway, New York.

DECORATIONS FOR A HALL.

We give a design for decorations for a hall and stairway, of moderate cost, for a country dwelling. Part of the glass of the windows is painted and part treated with beveled plate. The whole effect is rich and pleasing. Designed by C. J. Krumbeine, Argyle Park, Ill.



HALL DECORATIONS FOR A COUNTRY DWELLING.—DESIGNED BY C. J. KRUMBEINE, ARGYLE PARK, ILL.

DESIGN FOR A SUBURBAN COTTAGE.

This dwelling is designed for a locality where economy in width is desirable. Being in the main only sixteen feet wide, with a small wing on either side, the plan has been developed so that the accommodations are not sacrificed to the peculiar requirements of the situation. The staircase is so arranged as to be conveniently available from front and rear, and the parlor, dining room, and entrance hall can be thrown together for social occasions. The folding doors might be made to slide if preferred. The kitchen is sufficiently separated from the front portion of the house to exclude the odors from cooking, and is also properly located for at front

DWELLING AT DETROIT, MICH.

The perspective drawing and plan annexed represent a brick and frame house lately completed on Farnsworth Street, Detroit, Mich., from the designs and under the superintendence of Mr. A. C. Varney, architect, of 50 Campau Building, Detroit.

The house, which is of an attractive description, was built in a substantial manner, of good materials, at a cost of $2,600.

A SAFETY attachment for elevator cars has been patented by Mr. Charles R. Whittier, of Yonkers, N. Y. It is to prevent the elevator car from falling in case the hoisting rope should break, and consists of a special arrangement of wedges and counterweight rope, in connection with the hoisting ropes.

A FRAME SCHOOLHOUSE OF MODERATE COST.

SPECIFICATION

of the materials and labor required in the erection of a new frame schoolhouse in district No. 7, Cranston, R. I. Wm. R. Walker & Son, architects, 27 Custom House Street, Providence, R. I.

MASON'S WORK.

Excavations.—Excavate for the cellar 5½ feet below the finished grade around the building, leaving all the earth excavated and not required for back filling against cellar walls in the low part of lot near the two rear corners.

Cellar Walls.—Build cellar walls about 5 feet high by 1 foot 6 inches thick, from good building stone laid up dry; wall on a straight, true, plumb line, and level off same for starting the underpinning.

Cellar Steps.—Furnish materials and build cellar steps from 3 inch x 12 inch North River bluestone set in brick laid in sand and cement mortar, and the sides of cellar entrance faced up in stonework laid in cement and sand mortar.

Window Sills.—Furnish pointed granite sills to all cellar window openings.

Curbing.—Amend opening for cellar steps, and under the porches and steps furnish and lay down 3 inch x 12 inch North River bluestone flagging set in cement and sand mortar. The flagging under porches and steps to set on stone foundations two feet above grade.

Underpinning and Piers.—Furnish good hard body brick and build underpinning walls about 3 feet high by 8 inches thick, the brick on face of underpinning to be selected of even color and laid up in lime and sand mortar colored red. The remainder of brickwork to be laid in lime and sand mortar.

Chimney.—Furnish good building bricks and build the chimney of the size and in form as shown and figured on drawings. The walls to be laid up 8 inches thick in lime and sand mortar, with 16 inch x 30 inch cast iron door frame and door in the base of the chimney and openings cut through the walls for inlet of ventilating pipes when and where required. Top the chimney out through roofs with selected body brick laid in red colored mortar, with a 6 inch x 8 inch split faced bluestone belt at starting of openings in face; the belt to have good beds and 1 inch drove margin lines on outside corners. Inside of chimney finish and set up one 10 inch cast iron smoke pipe 40 feet high with ⅜ inch shell, to have flanged and bolted joints and ten inch inlet under first floor joist; the inlet pipe to bolt on the main upright pipe and to extend out to and through the brick wall of chimney.

Pointing.—Point up the stone walls inside of cellar with lime, sand, and cement mortar, and whitewash all stone and brick work inside of the cellar.

Grading.—When underpinning is laid up, grade up around same to a line 2 feet 8 inches below the top, so as to incline the earth away from the cellar walls.

Lathing.—Lath the walls and ceilings of all the rooms, halls, wardrobes, and sides of stainings to basement and loft with best quality four foot spruce laths with four nailings to each, the side joints to be laid ¼ inch open and the end joints broken at every 3 laths. The lathing in schoolroom to stop at a level line 2⅓ feet from the top of finished floors, and in all other rooms, wardrobes, and halls to a line four feet above the floor.

Plastering.—Plaster all the walls and ceilings above specified for lathing, one good coat of brown plastering mortar made from slaked, screened, and puttied lime, laid one week to cool, clean sharp grit mortar sand, long well beaten cattle hair, and clean water used in the proper proportions for mixing good strong plastering mortar, to be well rubbed into the joints between laths, forming good strong clinches back of same, to be put on of even thickness, straight and true at all angles, and when at the proper stage of drying to be thoroughly troweled to a hard smooth surface. Any broken places in the mortar, after woodwork is put up, to be repaired in a smooth and workmanlike manner.

Finally.—The mason to remove all rubbish from the inside of building and cellar, to sweep out the interior of building when plastering is done, to do all work in a good and workmanlike manner, when the same is required, and without delay or hinderance to the contractor for the carpenter's work, and to furnish three pounds to the square foot sheet lead flashings, and build the same into walls of chimney where the same comes out through the roof.

CARPENTER'S WORK.

Framing.—Frame the building with good sound straight sawed spruce timber of the following dimensions: Sills, 3 in. × 6 in.; first floor joists, 2 in. × 10 in., 16 in. from centers; posts, 4 in. × 6 in.; window and door studs, 3 in. × 4 in.; intermediate studs, 2 in. × 4 in., 16 in. from centers; plates 4 in. × 5 in; ceiling joists, 2 in. × 8 in., 24 in. from centers; tiner posts, 6 in. × 6 in; lower plates, 6 in. × 6 in.; braces, 4 in. × 6 in.; studding around the circle, 2 in. × 6 in.; plates and girts made of two thicknesses of 2 in. spruce planks sawed on the circle. The rafters in roofs to be 2 in. × 7 in., 20 in. on centers, with 2 in. × 6 in. in cellar joists; over the center of each schoolroom to be framed a truss with 6 in. × 10 in. tie beam, with 6 in. × 8 in. straining beam and rafters, and 1⅛ in. iron rods with nuts and washers.

Boarding.—Board the walls and roofs with 1 in. hemlock boards, surface planed to ⅞ in. thick, and well nailed to the framework.

Under Floors.—Furnish and lay down ⅞ in. hemlock under floors to first floor, and a strip 3 ft. wide down through center of loft.

Shingles.—Shingle to roofs with best quality shared cedar shingles laid not over 5 in to the weather, and well nailed to the roof boarding. Shingle the walls from the top of window belt to the under side of cornice with best quality sawed cedar shingles, laid in straight courses not over 5 in. to the weather, and well nailed on.

Clapboards.—Cover all walls between the bottom board and window belt, including the nailing of porches, with 4 ft. eastern-sawed sap clear white pine clapboards, planed and painted, laid not over 4 in. to the weather, and well nailed, with all nail heads set in and united at all corners.

Paper.—Under clapboards, shingles, and trimmings on walls of building lay one thickness of "Bird's" waterproof sheathing paper, lapped not less than 2 in. at all joints.

Trimmings.—Get out, make, and set up from clear dry seasoned white pine, all the window and door frames, cornices, bottom boards, belts, and porches. To be made as per detail drawings furnished. The walls and ceilings of entrance porches to be covered with dry seasoned matched ⅞ in. white pine, with a ⅞ in. angle bead in corners of the arches. The floors of porches to be made from 1⅛ in. by 4 in. clear dry Southern hard pine jointed on the edges and laid ⅛ in. open joints, the sill and floor joist of porches first being covered with two thicknesses of tarred sheathing paper laid on top of the joists. The steps 1⅜ in. and risers ⅞ in., to be made from clear dry Southern hard pine, laid on stout 3 in. chestnut stringers sawed to receive treads and risers. The railings at ends of steps to be made from dry whitewood or pine, with turned tops on the posts and turned or straight moulded balusters. The thresholds of the doors at entrances to be made of clear dry seasoned 2 in. ash. In the cornices of the porches are entrance steps. Lay in a good sized gutter, line it with best I. C. tin, M. F. brand, well laid and rosin soldered, and run 3 in. galvanized iron leaders from the gutters to the ground, and turn bottom ends out with galvanized iron shoe at bottom.

Belfry.—The deck of belfry to be made by laying down 2 in. matched dry spruce on 4 in. x 12 in. floor boards, and to be a scuttle 2 ft. x 3 ft. through the deck with a step ladder leading to same from under the roof of building. The bell deck to be covered with I. C. roofing tin, M. F. brand, well laid and rosin soldered, and to turn up on sides of belfry 12 in., with the joints wiped with solder. The scuttle in deck to be covered with tin same as deck, hung to former with stout strap hinges, and fasten with stout iron hook and staples from inside. The walls inside of belfry to shingle same as walls of tower, the soffits of arches to be ⅞ in. matched white pine, with bead on outer corners to receive shingles, and the ceiling of belfry below plate to be ⅞ in. matched and beaded pine, fastened to 2 in. x 6 in. ceiling joists laid 2 ft. from centers. The finial and vane at apex of tower roof to be made from 20 ounce cold rolled copper, with the balls, vane, and flutes in skirt covered with gold leaf.

Cellar Windows.—The cellar window and door frames to be made as shown on plans, and set in walls whenever the masons are ready therefor.

Sashes.—The window sashes to be made from clear dry seasoned and kiln dried 1½ in. white pine, and of the forms and sizes shown on plans and elevations. To be glazed with second quality French sheet glass, and all windows on first floor hung to the frames with braided cotton sash lines passing over 2 in. polished wheel axle pulleys and counterbalanced with cast iron weights in pockets of the frames, weights in mullions of the main frames to have 2 in. pulley in the top ends of same. The sashes in gable end windows to be fitted and screwed in. The cellar window sash to be hung to frame with strap wrought hinges, and fastened at top with stout iron bolts.

Furring.—Cross furr the ceiling of all first story with ⅞ in. x 2 in. spruce strips, 16 in. from centers, and put up straight and true and well nailed. Furnish and put up ⅞ in. x 2 in. grounds at top line of the ceiling on sides of rooms, around windows and door openings, the grounds to be straight, true, and out of wind.

Door Frames.—Make door frames from 2 in. dry, seasoned plank (white pine), rebated to receive the doors, and when plastering is dry, set the same in door openings of partitions, straight, square, true, and plumb, and securely fastened in their partitions. All door frames from halls to schoolrooms to have 20 in. top light over the doors.

Partitions.—Partition the interior into rooms, as shown on the floor plans, with 2 in. x 5 in. straight sawed and sized spruce studding, set 16 in. from centers, with row of straight 2 in. x 5 in. bridging at top line of ceiling on walls, and one row of 2 in. x 4 in. bridging at the top line of blackboards The studs to be doubled and trussed at side and top of all openings for doors, and to be segment arched turned above sinks in the halls.

Stairs.—Build stairs to attic and basement with 1⅛ in. treads and ⅞ in. risers of dry spruce, and fastened to 2 in. x 10 in. sawed spruce stringers, and the front edges of treads to be a half round. The partitions around basement or cellar stairs to be 2 in. x 3 in. studs.

Finish.—Finish good, dry seasoned, and kiln dried white pine mouldings, 5½ in. x ⅞ in., and case all window and door openings on first floor of schoolhouse. Furnish material and ceil up the walls of schoolrooms 2½ ft. high with ⅞ in. x 4 in. matched and beaded whitewood or pine strips, set perpendicularly, with chalk shelf, and moulding at top edge of ceiling and 3½ ft. above chalk shelf. Finish and put up a ⅞ in. x 5 in. surface moulding, thus forming top of blackboards. Ceil the walls of all other rooms, wardrobes, and halls with the same ceiling boards as above mentioned, 4 ft. high, with a ⅞ in. x 5 in. surbase moulding at top of the ceiling.

Doors.—The doors to be of clear, dry seasoned, and kiln dried white pine, 1¾ in. thick from panels to each door, with moulded faces and wide moulded middle rails. To be a 1¾ in. pine sash top light over each door from schoolroom to hall, and glazed with one light French sheet glass, and hung to frame at bottom rail of sash, with stout "Stanley" wrought iron butts, and operated with one "Molensack" transom lift to each top light. The doors to be hung to frames with three 5 in. x 5 in. loose joint cast butts, and trimmed with lock and knobs, cost $2.50 for each door, and selected by the architect. To be rubber head stop knobs, set in ceiling behind where each door swings, to prevent door knobs from striking.

Platforms.—Furnish good, dry-seasoned ⅞ in. planed and matched clear Southern hard pine, and build platforms for teachers 10 in. high and of the size shown.

Floors.—Furnish good, dry-seasoned and kiln dried ⅞ in. planed and matched clear Southern hard pine flooring of the best quality, no boards over 4 in. wide, and lay down the top floors of schoolhouse to have two thicknesses of best deafening felt between under and upper floors, to be laid to close joints, blind nailed and smoothed.

Thresholds.—To be ⅞ in. or ¾ in. dry, clear Southern hard pine thresholds under all inside doors.

Wardrobes.—Put one shelf around each wardrobe 12 in. wide and at the line of top of ceiling or surbase moulding. Under the shelf and top of the ceiling boards furnish and screw on stout japanned double wardrobe hooks, 36 in each wardrobe.

Closets.—In each teacher's closet put down 7 in. base board with 2½ in. x ⅞ in. moulding top of same, one 12 in. shelf across back of each closet, a 3 in. strip around sides of each closet, with 12 stout japanned double hooks screwed to strips in each closet.

Sinks.—Furnish, set, and case up two cast iron sinks, four feet long, with the inside of sink enameled, to waste through 2 in. tar coated cast iron pipe with lead calked joints, to outside of cellar walls.

Books.—The space under arch at side of closet in each teacher's room to have a pine case with movable shelves built into the recess and with a light moulding around top of shelving.

Ventilation.—Furnish good, sound, dry box boards and build 8 in. x 16 in. wide ventilating ducts from the floors of each schoolroom to attic, and thence into the brick ventilating duct, each flue entering the brick chimney independently. At the base of each flue in schoolrooms furnish and set in one 16 in. x 20 in. enameled cast iron ventilating register, secured to the ceiling of room.

Cutting.—The carpenter to furnish men to do any cutting that may be required for the heating pipes, and to cut in all the registers in floor which are furnished him by the contractor for furnaces.

Top Lights over Windows.—The two top lights over single windows in each schoolroom to be hung to transom, and operated with Molensack fixtures, the same as specified herein for the top lights over doors.

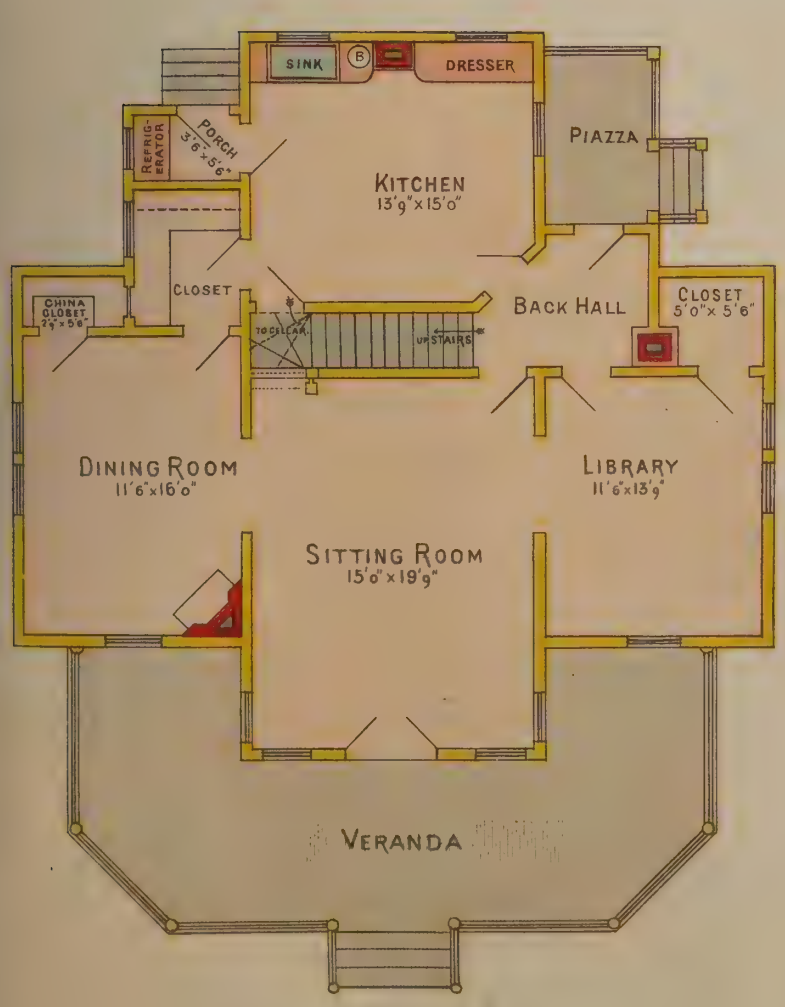
Painting.—Paint all the exterior woodwork, other than roofs, two good coats of linseed oil paint, mixed to the colors as architects shall designate, and in two or more colors. The priming, or first coat, to be a good, heavy coat of paint, put on as fast as the woodwork is put up. The nail heads and cracks to be putty stopped between first and second coats of paint. All pulley stiles of windows stained with a red oil stain, and all tinwork painted two coats "Prince's" metallic paint. Paint all interior woodwork, other than floors and stairs, three coats of white lead, oil, and turpentine, colored as architects desire, and in two tints. Putty stop all nail heads and cracks, and draw all window sashes and top lights two coats Indian red. Oil all the Southern hard wood pine, floors, and platforms one coat best linseed oil, with umber stain in same.

Finally.—All work to be done in a good and workmanlike manner, under the superintendence of the architects, and in strict conformity with the drawings furnished and these specifications.

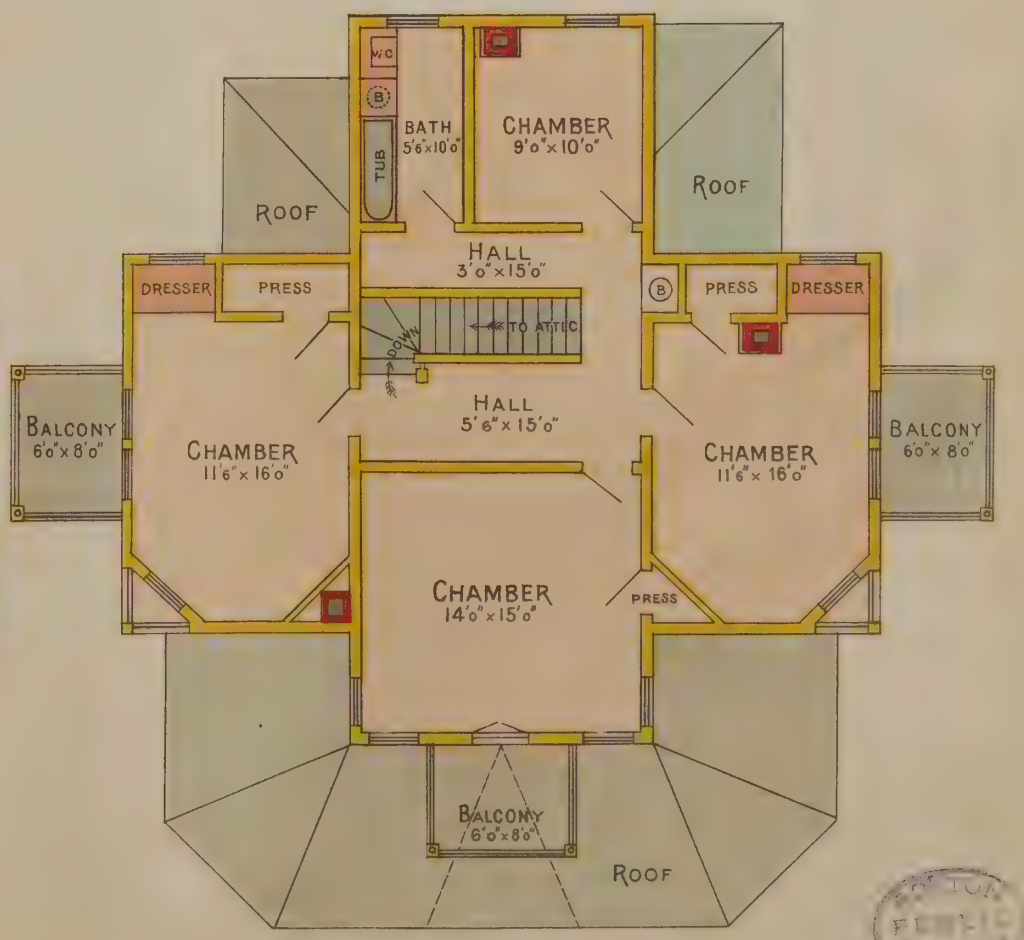
A One Story Dwelling With Detached Kitchen. CHRISTOPHER MEYERS, ARCHITECT

Plan of First Floor.

A Two Thousand Six Hundred Dollar Cottage. GEORGE W. CADY, ARCHITECT.

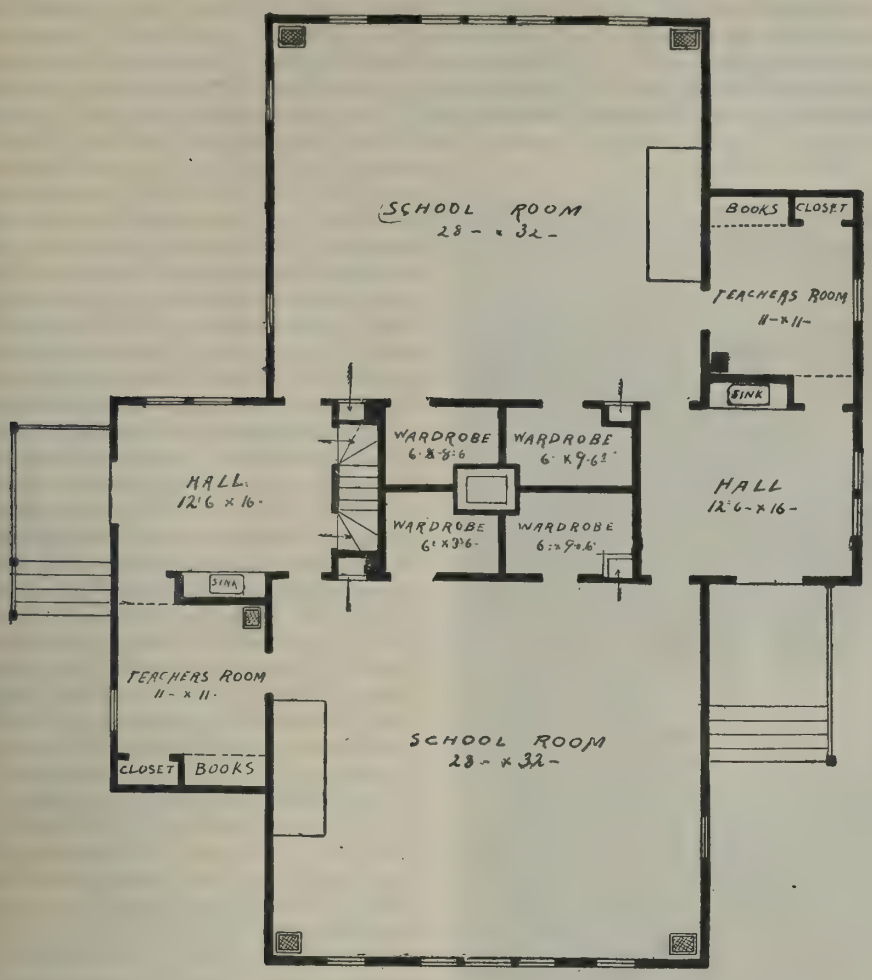


Plan of First Floor.

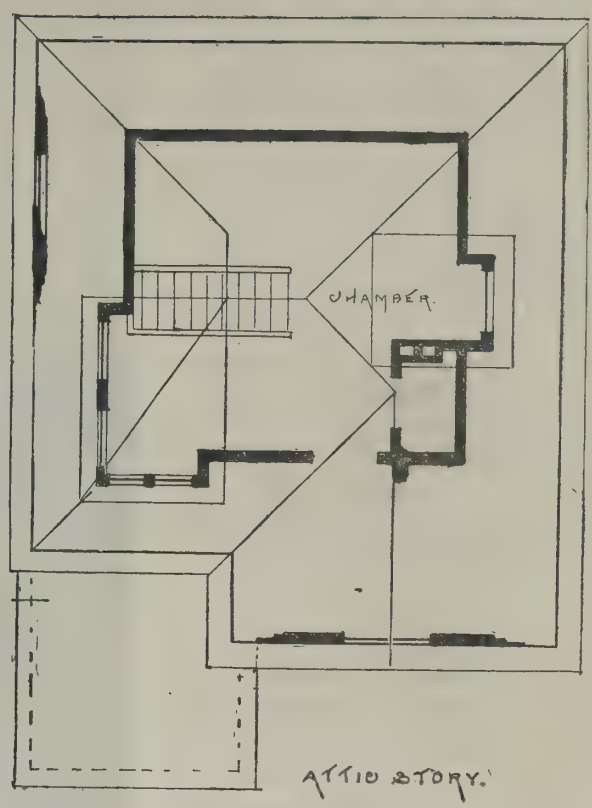


Plan of Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK.



FLOOR PLAN



ATTIC STORY.

A FRAME SCHOOLHOUSE OF MODERATE COST.

THE PAMPAS GRASS.

A stately mass of pampas grass in full plume is always a beautiful sight in a garden, and particularly if so placed that the surroundings heighten its effect. In such a position is the noble specimen in Mr. Gatehouse's garden at Chichester, who kindly sent us a photograph of it, taken last season by Mr. Malby. It was then exceptionally fine, the great mass of plumes being nearly ten feet high. It is planted in a part of the garden snugly surrounded by trees. Close to it is a stone-edged water basin and fountain, so that this corner is a pretty feature of the garden. The ring of flowering plants around the base of this pampas is decidedly a mistake. Such a stately plant as the pampas needs no embellishing, and it never looks better than when seen rising from a lawn with room to spread out its grass in a graceful way. The soil about the plant can be now and then enriched in the same way as when a circular bed is made around it. Mr. Gatehouse's pampas is of the best variety, the one that produces large spreading white plumes. There is such a great difference between the good and the bad varieties of the pampas, that care should be taken to get the best form, seeing that the plant always forms an important permanent feature of a garden, if it succeeds, and one that takes a long time to develop, and which is so difficult to replace.—*The Garden.*

PAMPAS GRASS.

[The Garden.]

A NEW ORLEANS GARDEN.

About gardening in New Orleans, and about our own garden in particular, I am sorry to say there is not much to record. Ground being very cheap here, all the best residences, the majority of which are wooden, are built upon large "lots," measuring each from 80 ft. to 125 ft. in front by 160 ft. to 250 ft. in depth, and in some cases much more. This arrangement allows free ventilation and sunlight, and sufficient space for town gardening where people choose to take advantage of it. There have been but few attempts, however, at artistic effect; on the contrary, the grounds are planted in the most desultory manner, the main effect being apparently to get as much into them as possible. Notwithstanding, the general effect of these "wild gardens" is decidedly pleasing, and, in consequence, New Orleans has a widespread reputation for beauty, in addition to the quaint picturesqueness of the French quarter, about which so much has been said. As our winters are generally short and mild, and the atmosphere quite moist, vegetation is strong and rapid in its progress, so that in two or three years new dwelling houses, which are never more than two stories high, become embedded in dense verdant thickets, which, but for the saw and shears, would soon crowd those structures not only out of sight, but occasion speedy ruin and decay.

Our shade trees are for the most part natives, such as oak (several species), cypress, elm, catalpa, sweet gum (liquidambar)—probably the most beautiful of all—plane, hackberry, magnolia grandiflora, pine, cottonwood, etc.; to which may be added, of foreign introduction, tallow tree (stillingia sebifera), privet (ligustrum japonicum), pride of India, or China (melia azedarach), Japan varnish (sterculia platanifolia), and ailantus. For ornament the orange tree is in general use, especially the bitter species, which is not only somewhat hardier than the edible orange, but holds undisturbed possession of its beautiful fruit from one season to another. In addition to oranges we have palms, of which there are three indigenous species, and about as many more from abroad which are equally hardy; also pittosporums, magnolia fuscata, oleander (pink, crimson, purple, lilac, and white flowered), sweet olive, smoke tree, laurustinus, Chinese azalea, bottle brush, castor oil, camellia, crape myrtle (lagerstrœmia—crimson, rose, lilac, and white flowered), the prince of all flowering trees; cape jessamine (gardenia florida), pomegranate, yucca, cycas revoluta, banana, bamboo, poinsettia, agave, acalypha, alocasia, and others too numerous to mention.

In regard to my own garden, after several years of unsatisfactory work, I laid it out upon what is sometimes called the French system, *i. e.*, in circles and in portions of circles, and it has proved to be quite a success. It has no walks, the result being a long, unbroken sward,* which, besides its intrinsic beauty, deepens the perspective, and adds very greatly to the effectiveness of the water, rockery, and tree plantation in the rear.

For flowering plants, we rely mainly upon roses, more especially teas, all of which flourish in the open air without protection, and the display of color which they produce in March, April, and May is truly magnificent. Even now and until Christmas an abundance of blooms may be cut for house and table decoration. Besides roses, cannas—of which ehemanni is by far the best—crinums, hydrangeas, Chinese hibiscus, lantanas, abutilons, plumbagos, chrysanthemums, and a host of others with which readers of the *Garden* are familiar adorn the borders. For bedding purposes we rely principally upon pansies, anemones, phloxes, gladioli, and hyacinths for early spring; portulacas, pelargoniums, petunias, torenias, salvias, asters, balsams, and coleuses for summer; and chrysanthemums, dahlias, zinnias, etc., for autumn and early winter. At present (November 20) the garden is all ablaze with roses, zinnias, alternantheras, acalyphas, poinsettias, chrysanthemums, acacia corymbosa, perennial ipomæas, antigonums, annual thunbergias, manettias, etc. For covering trellises and verandas, we make another large draught upon roses, such as Marechal Niel, Solfaterre, Lamarque, Queen Henrietta, Gloire de Dijon, Ophirie, and Perle des Jardins; but, in addition to these, much use is made of rhynchospermum jasminoides, solanum jasminoides, wistarias, bignonias, clematises, antigonums, honeysuckles, ipomæas, and aristolochia elegans. The seed of the aristolochia was received by Mrs. Richardson some years ago without any name, and has been extensively cultivated ever since. It requires but little protection in winter, and when killed to the ground shoots up again early in spring.

In our pond, which is cemented, we grow several species of nymphæa, of which devoniensis and rubra are probably the most satisfactory; also nelumbiums (speciosum and luteum), pontederia crassipes, limnocharis humboldti, pistia, and trapa. The last, in consequence of its very rapid development, has to be cleared out every few weeks. Last season we succeeded in flowering the Victoria regia without artificial heat, the young plant having been started in the propagating house, and transplanted early in June.

For some years past I have been endeavoring to acclimate some of the subtropical palms which grow at considerable altitudes in their native countries, and thought that I had succeeded in adding quite a number to our old list until last winter, when the extreme cold which we experienced wrecked all my hopes. Only one genus (sabal) is indigenous to this locality, and of this we have two species, adansoni and serrulata. To this may be added s. palmetta and pritchardia filifera, which belong to the same latitude, the former in Carolina and the latter in California. Two species of chamærops, excelsa and fortunei, and phœnix dactylifera were naturalized long ago, and of late years cocos australis has also been found to be quite hardy. To these I had added phœnix tenuis, sylvestris, reclinata, canariensis, spinosa, and rupicola, sabal blackburniana, jubea spectabilis, corypha australis, latania borbonica, kentia belmoreana, and rhapis flabelliformis, and by means of such protection as was afforded by stuffing Spanish moss (tillandsia usneoides), which hangs in such profusion from our forest trees, between the petioles so as to envelop the crown, all went well for some time. Phœnix reclinata and canariensis and latania borbonica had already attained considerable size, the former furnished with a trunk 5 ft. high by 2½ ft in diameter, and the latter with one 3 ft. by 12 in.—the admiration of every passer by. Many of our neighbors, profiting, as they supposed, by our successful experiment, made similar plantations upon a smaller scale, and, therefore, the part of New Orleans in which we reside had begun to assume quite a tropical appearance. But, alas! for all our joys and hopes, on the 8th of January, 1886, there came from the far-off Rockies in the Northwest a "blizzard," which carried death and destruction not only to all delicate and half-

* Our best lawns consist of Bermuda grass (cynodon dactylon ?), which forms a beautiful turf, but, unfortunately, loses its leaves by the first frost. Has its seed ever been discovered ?

VIEW IN DR. RICHARDSON'S GARDEN, NEW ORLEANS.—[From a Photograph.]

hardy vegetation, but also destroyed many of our indigenous trees and shrubs, and even extended its ravages into countries ten or twelve degrees south of us, destroying some large plantations of coffee trees on the east coast of Guatemala.

The thermometer registered 12° Fahr., and the ground remained frozen for a week—a circumstance which had not happened along this coast before for more than sixty years. It was not until the weather became warm that we began to realize our losses, and, in some cases, not until the following spring. Suffice it to say, there now survive one phœnix canariensis, two large sabal palmetta, two chamærops, one cocos australis, one jubea spectabilis, and several small sabal adansoni and serrulata. Although greatly discouraged, yet, hoping that we may not live to experience such another visitation of northern weather, we have inaugurated another similar experiment. I ought to say, in praise of the sabals, chamærops, cocos, and jubea, that they stood the severe trial without any protection whatever.

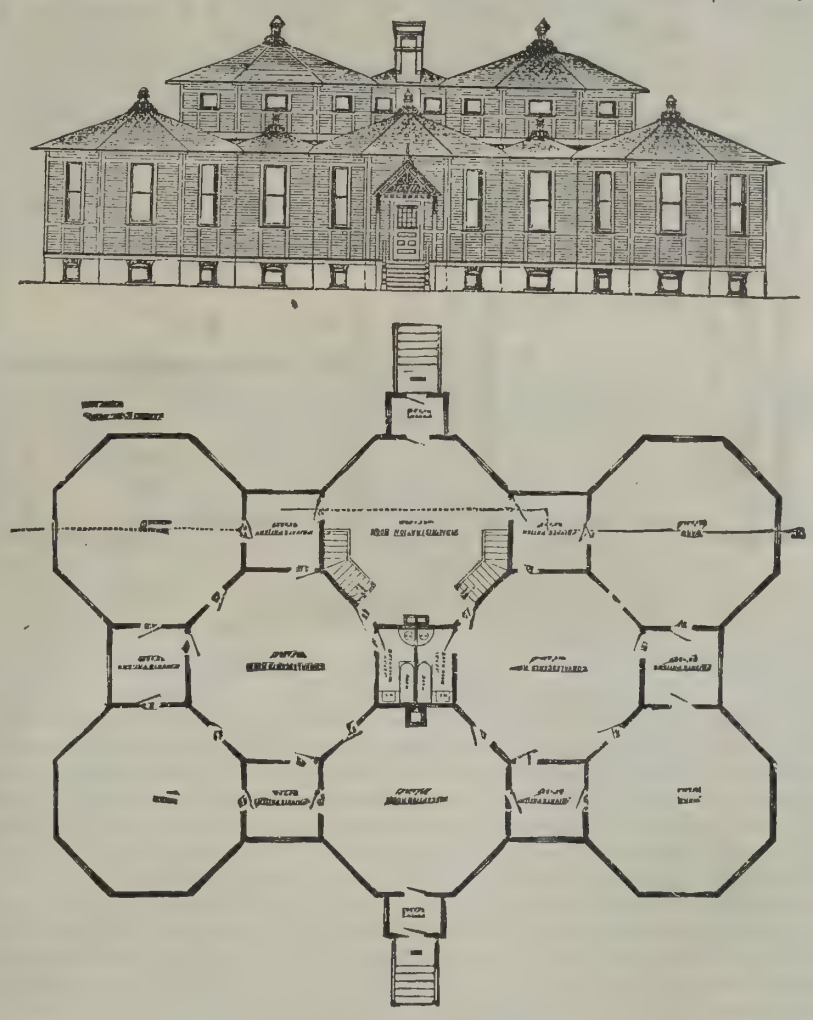
The length which my remarks have already run forbids even the enumeration of other plants which succumbed to this terrible frost. The death of four-fifths of all the orange trees in this neighborhood was, of course, the greatest loss, both on account of their economic and decorative value.

T. G. RICHARDSON, M.D.

A MUNICIPAL HOSPITAL.

The city of Detroit, Michigan, after a struggle and conflict of many years' duration, has at length got an excellent hospital completed. It was designed by Health Officer Dr. O. W. Wight. He had certain ends in view, and planned an edifice in order to secure them practically. The architecture was made to conform to certain ideas of sanitary use. No closets for the heedless storage of infected clothing and bedding; no hollows in the walls or under floors for the burrowing of hospital germs; no attic places for the accumulation of contagium in the infected air; regulated warmth, dry and non-absorbent material, plenty of softened light and good ventilation—such were the needs of a contagious disease hospital, and the problem was to secure them by a structure at once economic and convenient for use.

Brick and stone were rejected as material, involving as they do either dampness or hollow walls. A frame would also necessitate "dead spaces" behind the plastering and above the ceiling. The method of building a grain elevator suggested the idea of the construction. Thus solid wooden walls could be made, which, when properly painted, would be non-absorbent, not subject to change of temperature, and dry. In order to avoid needless weight of material, awkwardness of form, unsightly partitions, and sharp angles; in order to secure the greatest amount of light, sunshine, utilization of the entire inclosed space, and convenience of administration; in order to obtain accommodation for the greatest number of patients at the least expenditure; in order to obtain wards of moderate size and proper rooms for needful isolation of the moribund or delirious; in order to arrange for speedy disinfection and cleanliness, the plan was adopted of a series of octagons separated by square rooms, all contiguous, yet separated by solid walls of painted wood, although communicating with doors wide enough to admit of the easy passage of the regulation hospital beds.



A MUNICIPAL HOSPITAL.

A glance at the illustrations will show the arrangement of the larger octagon and smaller square rooms. There are six external octagon rooms, twenty-four feet in diameter. There are also six external square rooms, ten feet across. All these inclose two octagon rooms, with an intervening square room, of the same size.

The basement, half under ground, half above, is made of hard burned brick, laid in good cement, and well cemented on the outside of the wall. It is paved with hydraulic concrete, and is nine feet high to the lower edge of the floor joists, which are mill dressed. There are double glazed windows all around, opening and shutting with transom rods. The basement rooms all open into one another. Thus is secured clean, well ventilated space for boiler room, kitchen, laundry, pantries, drying rooms, water closet and bath room, etc., etc. Doors from without lead to the basement on both sides of the building. The planed under surface of the floor above constitutes the ceiling of the basement. The walls are finished in hard calcimine. All the domestic arrangements of the hospital are thus amply provided for without encroaching upon the floor of the building devoted to patients.

Above the foundations the walls are built up with seasoned two by four pine stuff, laid flatwise and fastened together with long nails. The stuff is dressed to gauge, and the inside of the wall is planed smooth before painting. The outside is boarded up and down, so that the walls are solid, and five inches thick when finished. The height of the walls is fourteen feet from the floors. The windows are four feet from the floor, double glazed, divided into three parts, the middle stationary, the lower sliding up, the upper opening with transom rods. The doors are extra wide, to admit of rolling beds from one room to another. The floors are double, the lower course of pine, the upper of white maple. The two central octagons and the intervening square are carried up six feet higher, with windows all around above the adjacent roofs, opening and closing with long transom rods, for ventilation and light.

The roof all over is broken up into separate cones, with one-fourth pitch, over each room, with intervening gutters. The roof is of solid wood, two and one-half inches thick, covered with tin. The under side of the cone-shaped sections of the roof over the separate rooms is the ceiling of the rooms. There is no upper floor, consequently no attic spaces at all. The thickness of the timber roof is to prevent heating through in summer and chilling through in winter. The hospital part of the building is one story, and all rooms for the sick are open from the double floor to the thick solid roof. At the center of each conic section of the roof, consequently at the apex of each room, is a solid ventilating shaft, octagon or square in form, according to the shape of the room, extending four feet above the roof, hooded to prevent the entrance of rain and snow, the opening of which is regulated from the inside.

The central rooms are also ventilated below by shafts from the outside. The two bath rooms and water closets into which the central square is divided are ventilated with elaborate care.

The whole building is heated with low pressure steam. Some of the more exposed rooms have three radiators. All radiators are placed under windows, and air is introduced to them by apertures through the wall behind them, regulated by slides.

The hospital is supplied with water from the city water works, and the sewers and drains are constructed in the most careful manner. The whole building is lighted with gas.

There is no plastering in the building. Each room, lined with painted and varnished wood, can be washed out with a hose, like a tub. There is no hollow space in the whole structure big enough for a mouse to creep into. The walls are non-absorbent, and the whole hospital can be kept clean and sweet with a minimum of care and toil. The building, containing no blind spaces, is practically fire-proof. Fire cannot be concealed in solid wood, and will not kindle and spread where there can be no draught. Besides, a hydrant at the door, ready to attach hose, will furnish complete safety.

The whole cost of the building, including plumbing, heating apparatus, and especial provisions for lighting, is not quite eleven thousand dollars, and will accommodate fifty patients without crowding. It stands in the middle of ten acres of ground, is within two and one-half miles of the center of Detroit's population, and yet is quite in the country. The county of Wayne furnishes the ground and unites with the city in the maintenance of the hospital. Thus the surrounding townships will be cared for and the danger to Detroit diminished.

In one corner of the grounds, two hundred and fifty feet away from the main building, are three "huts," technically so-called, sixteen by twenty-four feet, built of wood, solid, provided with water, sewerage, light, and warmth, in which eight or ten small-pox patients can be cared for well. Small-pox is epidemic only once in six or seven years. Sporadic cases in the long intervals can be cared for in these small buildings, while the main hospital can be devoted to other contagious diseases. The structure of all the buildings is such that they can be thoroughly and safely cleaned and disinfected in a few hours after long occupation by small-pox patients.

An eminent English sanitarian, a few years ago, expressed the wish that contagious disease hospitals might be constructed of "deal boards solid," as the safest and cleanest material. His idea has been first realized by the city of Detroit, with scientific precision of details and in an ingenious original form.—*Sanitary News.*

White into Gray Cast Iron.

M. Ferdinand Gautier has communicated to the *Comptes Rendus* some observations upon cast iron. He says that gray iron alone can be perfectly worked in foundries; the white iron being too hard. Gray can be transformed more or less completely into white iron by the chill, through the intermediary of a metallic mould which rapidly cools the metal, and makes the graphite pass into the state of combined carbon. But the inverse problem—that is to say, the industrial conversion of white into gray iron by special treatment (a process of fusion in the cupola, for instance), is not a current operation in the foundry. At the same time this transformation is of great importance, because by successive remeltings gray iron tends to become white, and thus to lose its value to the founder, and spoil his castings. M. Gautier has been struck by the experiment of Messrs. Stead and Wood, of Middlesbrough, who made a fluid and tough gray iron by the mixture of equal proportions of Cleveland white with a silicious pig; and he has repeated the experiment in France. His results are described as absolutely conclusive. By the addition of silicious iron to any variety of white iron, he succeeded in producing from the cupola a perfect gray metal, close grained, soft to work, very fluid, and in every respect suitable for moulding. The best kind of silicious iron for this purpose is shown by M. Gautier's experiments to be that which is freest from manganese; so that the Scotch iron which is commonly used to make a good, fluid metal may be advantageously replaced by one-quarter of its weight of 10 per cent ferro-silicium. In addition, it is shown by many experiments that the artificial gray iron made by thus precipitating the combined carbon of white iron is stronger, because of its homogeneity, than the natural gray iron, in which the graphite is more or less irregularly distributed.

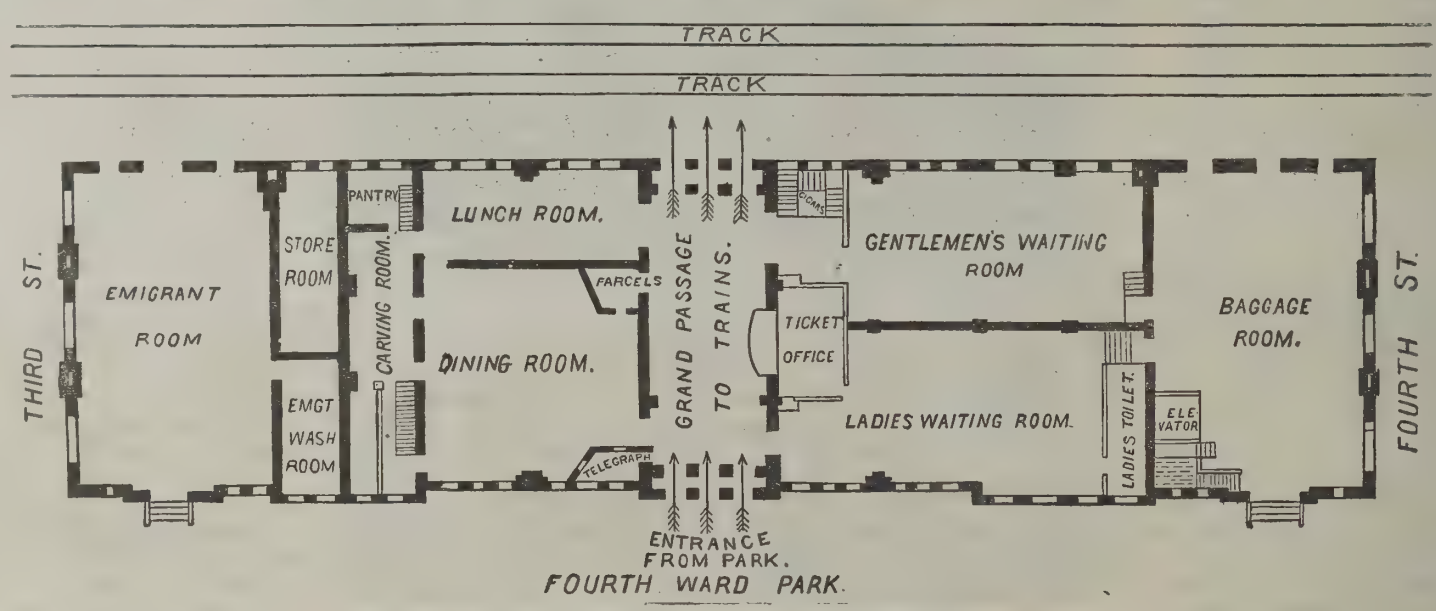
The Heating Power of Gas.

A series of tests has recently been made by Dr. Fischer, the well-known German chemist, showing that in ordinary domestic stoves in use not more than 20 per cent of fuel consumed is really utilized for warming the rooms, whereas, with stoves burning gas, 80 per cent and more of the possible effect is obtained. In a sugar manufactory at Elsdorf, it is stated no steam engines have been used for several years. Gas is made at a cost of about 10d. per 1,000 cubic feet, and is used for lighting and driving gas engines. At the Essen works, water gas is made at a cost of 4d. to 8d. per 1,000 feet, and serves both for fire and lighting.

NEW PASSENGER DEPOT OF THE CHICAGO, MILWAUKEE, AND ST. PAUL.

The elegant new passenger station of the Chicago, Milwaukee, and St. Paul Railway at Milwaukee is now completed, and trains began running into it a few weeks since. It is among the finest buildings of the kind, as will be seen from the elevation and ground plan, which we illustrate. It is situated between Third and Fourth streets, one and one-half blocks from Grand avenue, and fronts on a park on Everett street. The ground plan of the building shows a surface of 120 x 65 ft. There are three floors—the first 16 ft. in the clear and the other two 14 ft. each. In the center of the facade rises a tower to the height of 160 ft., reminding one in its graceful lines of some Venetian campanile, and dominating the landscape in every direction. The style of the structure is modern Gothic. The foundations are solid and enduring, being constructed of stone, with granite facings above grade. The material used in the construction of the walls is Milwaukee brick, faced with pressed Philadelphia red brick. The trimmings are of red sandstone and terra cotta in handsome patterns.

NEW PASSENGER STATION OF THE CHICAGO, MILWAUKEE & ST. PAUL RY., MILWAUKEE.



GROUND PLAN OF MILWAUKEE PASSENGER STATION.

The main entrance of the building is formed of a triple arch, supported by columns of polished granite. It is reached by a flight of six easy steps. The swinging doors of polished oak are a few feet inside the arch, being surmounted by stained glass windows in beautiful designs. These admit the visitor into the large central hall which bisects the building. This is 30 x 65 feet. The floor is of tile, in a well defined pattern and soft, pleasing colors. The walls are of red brick up to the spring of the arch. From there on they are in a soft, creamy brick. The lower portion of the wall is marked with geometrical patterns in different colored brick, while the creamy surface above is picked out here and there with a dash of dark color, as Beauty enhances her complexion by a black patch. Around the rear of the hall runs a gallery, which serves to give the light and lightness needed to the whole. This gallery is surrounded by a railing in hammered dull brass.

On the right of the main entrance is the ladies' waiting room, an apartment of handsome proportions, 30 x 84 ft., with tile floor, and finished in oak in natural color. To the rear of the apartment are well appointed toilet rooms. On the same side of the hall, and occupying the south side of the building, is the gentlemen's waiting room, of the same size as the other room, less a slight abridgment in length. Between the two is a bijou ticket office. All these rooms, as well, in fact, as all the rooms down stairs, with one exception, are finished in a similar manner to the ladies' room, and have tiled floors. The ceiling on this floor throughout is ribbed by heavy beams, whose possible heaviness is relieved by tinting in light color approaching a soft shade of Nile green. On the left of the entrance is the dining room of the hotel connected with the depot, a room 40 x 52 ft., finished as the other rooms, but with a wood floor. The lunch room, on the same side, is 16 x 52 ft. in size, and is furnished with folding stools for the benefit of its patrons. Between the two rooms is the telegraph office and the parcel counter.

To the right and rear of the hall an alcove gives room for a handsome oak stairway that leads to the second floor. This, in the west end of the building, is occupied by the train dispatchers of the different divisions, and it is safe to say that never before did train dispatchers have more comfortable or beautiful quarters. The most of the offices look directly out on the park. The east end of the building is occupied, with the exception of one room, for hotel purposes. Descending to the first floor, in the extreme west end of the building is found the baggage room, an apartment 52 x 56 feet in its floor dimensions. Immediately above it, and reached by a water elevator, is a room of similar size for the purpose of storing baggage not called for immediately. In the east end of the building is the emigrant room, of size the same as the baggage room, with heavily timbered ceiling and tiled floor. This room and the one above it, also intended for the same purpose, are well appointed for their special object. The building is lighted throughout by electricity and heated by steam, both being furnished by boilers and engine located in the east end of the basement.

Outside are large car sheds, 600 feet in length and 100 in width, supported by iron columns and girders, and roofed with corrugated iron. They cover five tracks on which the highest skill of the road master's art has been displayed. There is placed in the tower, at a height that will make it easily seen from a good part of the city, a big clock, the dials of which will at night be illuminated by electricity. The clock is one of the finest as well as the largest in the country. It has four dials. Those on the north and south sides are 11 feet in diameter, and those on the east and west are 9 feet. Each of these dials is composed of six sections of the finest ground glass, so joined together as to appear one solid piece. The pendulum of this mammoth clock is 14 feet in length, and weighs 400 lb. It is regulated for heat and cold. The cost complete is $500,000.—*The Railway Review.*

MINNEAPOLIS RESIDENCES.

We give herewith a couple of attractive elevations of dwellings erected in Minneapolis, Minn., both by Mr. E. E. Joralemon, architect, of Minneapolis. For the drawings we are indebted to the *Northwestern Architect.*

A FENDER has been patented by Mr. Baker V. Butts, of Halifax, N. C. It is formed of an inner and outer plate and damper, and designed to attach to open fireplaces to prevent coal, sparks, etc., from snapping out into the room, while in no way interfering when thus used with the draught of the fireplace.

RESIDENCE FOR E. B. GALUSHA, MINNEAPOLIS, MINN.

RESIDENCE FOR W. ANKENY, MINNEAPOLIS, MINN.

OLYMPIA, THE NEW AGRICULTURAL HALL, LONDON—EXTERIOR VIEW.

OLYMPIA, THE NEW AGRICULTURAL HALL, LONDON—INTERIOR VIEW.

[For description see page 66.]

OLYMPIA.

Close to the West Kensington or Addison Road Station of the Metropolitan District Railway, London, on its western side, a few yards from the Hammersmith Road, a large range of buildings has been erected by the National Agricultural Hall Company, which is intended not only for exhibitions similar to those held in the Agricultural Hall at Islington, of live stock, cattle, horses, and dogs, but also for military tournaments, performances of horsemanship and gymnastic feats, and other public entertainments requiring space, and for a great variety of recreations. These buildings together cover an area of four acres, and will be popularly known as "Olympia."

The grand hall, two acres and a half in extent, is the largest hall in the kingdom covered by one span of iron and glass. It is 450 ft. long by 250 ft. wide, including an outer parade 40 ft. wide, affording a total ground floor area of 109,750 superficial feet, or nearly one half greater than the area of the Agricultural Hall at Islington. The galleries over the outer parade contain 46,000 superficial feet of floor space. The central area on which the performances take place is nearly a third of a mile in circumference. A minor hall forms an annex to the grand hall, and can be used separately for exhibitions, concerts, balls, theatricals, musical or other entertainments, while connected with the galleries will be spacious saloons for lecture rooms, picture galleries, refreshment rooms, public and private dining rooms, and offices.

The open gardens, comprising five acres and a half, are immediately adjacent to the hall. They will be devoted to fashionable gatherings, garden and floral fetes, musical promenades, and outdoor sports. One special feature of the company's programme will be high class musical performances in the open air, and Olympia will be in constant use, summer and winter, for any and every class of indoor and outdoor amusement, instruction, and recreation of a high style and character.

The facade overlooking the railway presents a handsome combination of red brick and white stone, and it is expected that an arrangement may be effected with the railway by which a broad and commodious road may be laid out in front of the new building from the station up to the Hammersmith Road. The station and the building will be connected by a short covered way, so that passengers by rail to Addison Road may pass directly into the hall in any kind of weather without inconvenience.

The hall is covered in by an iron roof, in which many ingenious novelties in engineering detail have been introduced by its designers. The structure consists of semicircular arched ribs 7 feet deep, and 170 ft. clear span, placed 34 ft. apart, and having a clear height from the floor to the crown of the roof of about 100 ft. It constitutes the loftiest iron and glass roof yet erected in or near London, the Crystal Palace excepted. The original architect was the late Mr. H. E. Coe, whose work has been completed by Mr. Edmeston. The contractors are Messrs. Lucas & Son. The engineers for the ironwork were Mr. M. Ende and Mr. Walmiston, and the contractors for it were Messrs. Andrew Handyside & Co., of Derby.

We give an exterior view of the building from the *Illustrated London News* and interior view from the *Graphic*. The latter shows the spirited scene enacted on the occasion of the recent opening entertainment, when 9,000 persons were present, and a team of thirty horses from the Paris Hippodrome were driven by a standing rider.

A UNIQUE SYSTEM OF WATER WORKS.

BY E. O. HOVEY.

As everybody knows, water is frequently raised to a desired height by means of a hydraulic ram set in a stream at the foot of a hill, or at the bottom of dam, or at some other place where there is a natural fall of water; but at Elk River, Minn., there is a peculiar arrangement, a description of which may prove to be of interest.

The town is situated at the junction of the Elk and Mississippi Rivers, thirty miles northwest of Minneapolis. The geological formation is the area of modified glacial drift of central Minnesota. About half a mile northeast of the station the railroad passes within a few yards of the southwestern edge of a tamarack swamp, in which water is found on or near the surface. For a long time it has been known that, within a limited area southwest of the railroad at this point, good water could be had at a depth of eight feet, while just outside of this area water could not be found short of eighteen feet. The idea occurred to Mr. T. S. Nickerson, who lives at Elk River, and is water supervisor of the Breckenridge division of the St. Paul, Minneapolis, and Manitoba Railroad, that a hydraulic ram might be set so as to utilize this difference of water level. Test holes twelve feet deep were sunk with an elongated post hole auger, at the points marked A, Fig. 1, to determine the location of the edge of the basin of water standing at eight feet. Water failed to come into these holes, but at the point, B, Fig. 1, water was struck at the required depth. The operations which pertained directly to the setting of the ram are of especial interest. On a line supposed to be perpendicular to the rim of the basin a ditch sixteen feet long, two and a half feet wide, and about twelve feet deep was dug to allow the water to flow off while the "supply" well was in process of construction. This well is twelve feet in circumference and twelve feet deep. The first six inches of the well and ditch were cut through the light and sandy but fertile soil characteristic of this region, the next six and a half feet through loose gray sand. Then, on the line between the well and the ditch, the diggers struck a dike two feet wide at the top, but soon increasing in width to four feet, composed of coarse sand so firmly cemented by infiltrated oxide of iron and carbonate of lime as to render the use of the pick necessary in removing it. This dike is impervious to water, and, as shown in Fig. 2, has an inclination at this point of about 75° south of west. Northeast of the dike the well passed through coarse gravel containing many large stones, while southwest of it nothing but the loose gray sand was found. In the coarse gravel a copious supply of water was met with, which flowed off freely through the loose sand of the ditch.

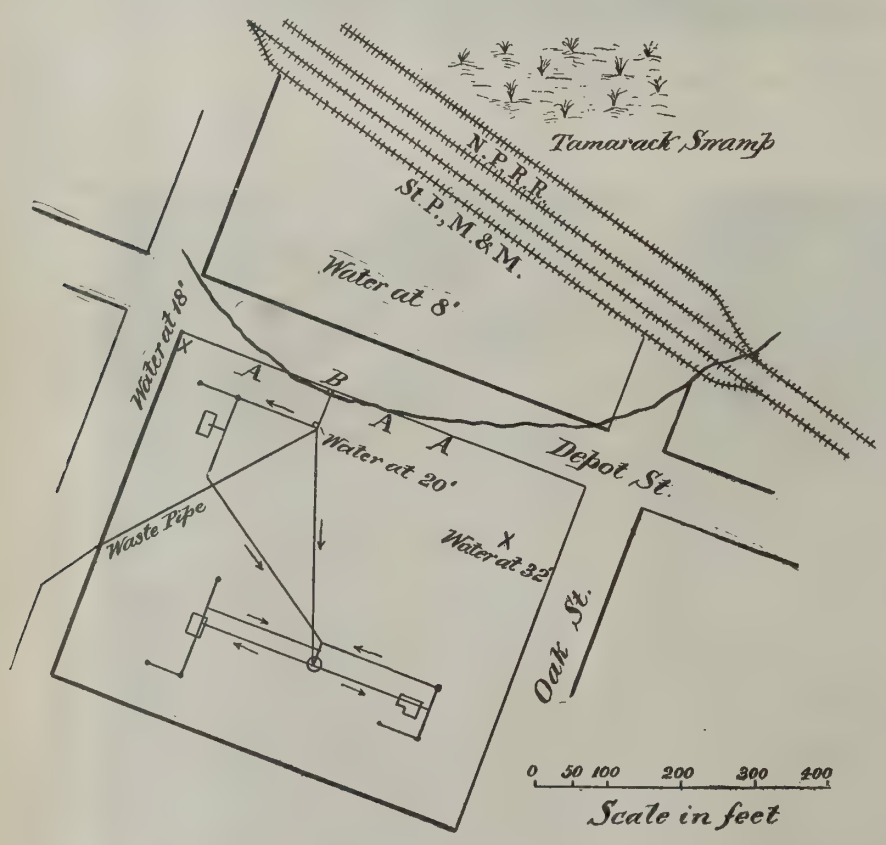


Fig. 1

A two and a half inch iron pipe was laid in the bottom of the well and ditch, the well was bricked up in the usual way, and the trench in the dike outside of the well was filled in with cement to make a water tight joint about the pipe and to prevent the washing away of the dike. Fifty feet southwest of this well another one, called the "waste" well, eight feet square, was sunk to the depth of twenty feet, and cairned to prevent caving. Water was met with at this depth, or the well would have been made deeper. A No. 6 hydraulic ram was then placed in the waste well at a depth of 16 feet, and was connected with the two and a half inch iron pipe mentioned above. The ram there has a head of water of eight feet, and it furnishes three houses and their dooryards with an abundance of water.

The arrangement of the pipes leading from the ram is illustrated in Fig. 1. Each pipe, after making the circuit of the house and dooryard which it supplies, is connected with a 250 bbl. tank, the bottom of which is 16 feet above the ground, which connection greatly increases the force of the stream at each faucet. In each pipe, after it passes through the house, there is a check valve to keep the water from flowing back from the tank through the house.

For about a year, *i. e.*, until the present summer, the waste water from the ram found free discharge through the loose sand surrounding the well; but lately the sand has seemed to be saturated with water, and drainage has not been sufficiently rapid. Therefore, some months ago Mr. Nickerson laid a two inch iron drain pipe from a depth of 18 feet in the waste well to a point 1,200 feet distant on the terrace of the Elk River, and the waste water is easily disposed of through this outlet.

The water within the basin is strongly impregnated with iron and has but little lime in its composition, while that from wells without the basin contains much lime and but little iron. The water from the tamarack swamp is like that found in the basin. The dike of coarse sand has been cut into at one other place, and found to trend in such a direction as to warrant the supposition that it forms a retaining wall on at least the southern and southwestern sides of the basin and tamarack swamp, thus preventing their waters from flowing off into the loose gray sand and descending to the general water level.

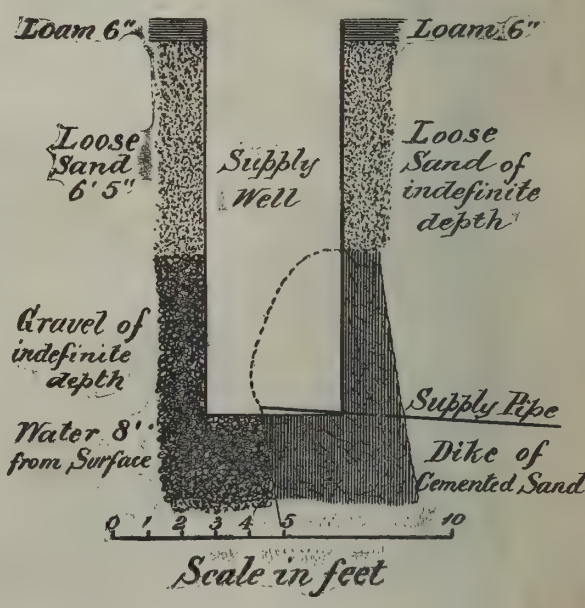


Fig. 2.

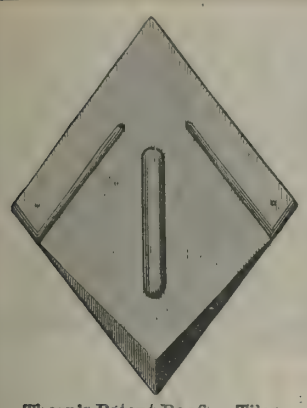
Curiosities of Alloys.

The way in which an alloy of gold and copper or other metal is affected by a small quantity of impurity presents one of the most serious difficulties with which our case makers and jewelers have to deal in working gold. It has long been known to workers in the precious metal that minute quantities of certain metals render it brittle and unworkable; and referring to this in a lecture at Birmingham, Professor Roberts-Austen, of the Royal Mint, said:

"It may be well to demonstrate the fact. Here are 200 sovereigns. I will melt them, and will add, in the form of a tiny shot, a minute portion of lead, amounting to only the 2,000th part of the mass; first, however, pouring a little of the gold into a small ingot, which we can bend and flatten, thus proving to you that it is perfectly soft, ductile, and workable. The rest of the mass we will pour into a bar; and now that it is sufficiently cold to handle, you see that I am able to break it with my fingers, or, at least, with a slight tap of a hammer. The color of the gold is quite altered, and has become orange brown; and experiments have shown that the tenacity of the metal—that is, the resistance of the gold to being pulled asunder—has been reduced from eighteen tons per square inch to only five tons. These essential changes in the property of the metal have been produced by the addition of a minute quantity of lead."

In the same lecture Professor Roberts-Austen said: "Here is a bar of tin, 2 ft. long and 1 in. thick, which it would be most difficult to break, though it would readily bend double. If only I rub a little quicksilver on its surface, a remarkable effect will be produced—the fluid metal will penetrate the solid one, and in a few seconds the bar will, as you see, break readily, the fractured surface being white, like silver."

A METHOD of purifying water has been patented by Messrs. William J. Morrison and John C. Wharton, of Nashville, Tenn. The invention covers a method of adding to the water a mixture of lime, soda, and sand, and then a mixture of alum, permanganate of potassium, and sand, the method being advantageous for all waters to be used for domestic purposes as also in the preparation of various beverages, and for steam boilers, laundry and bathing purposes.



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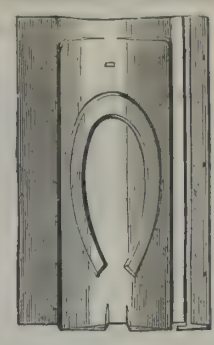

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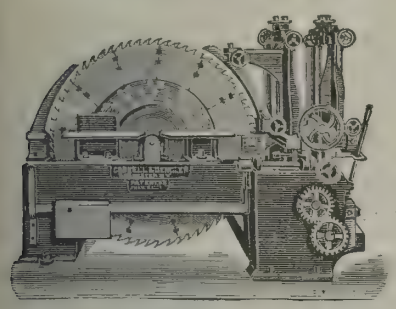

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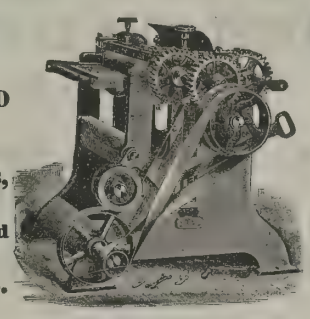

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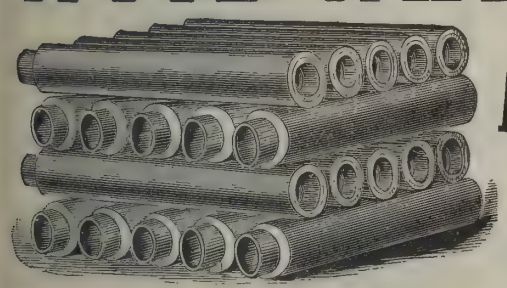

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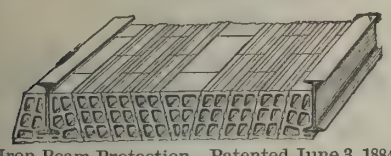

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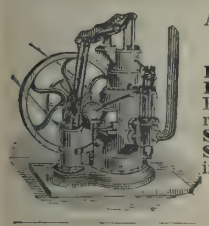

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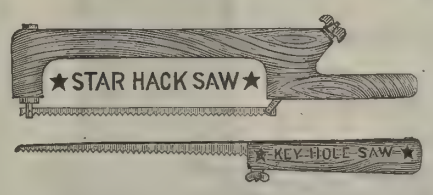

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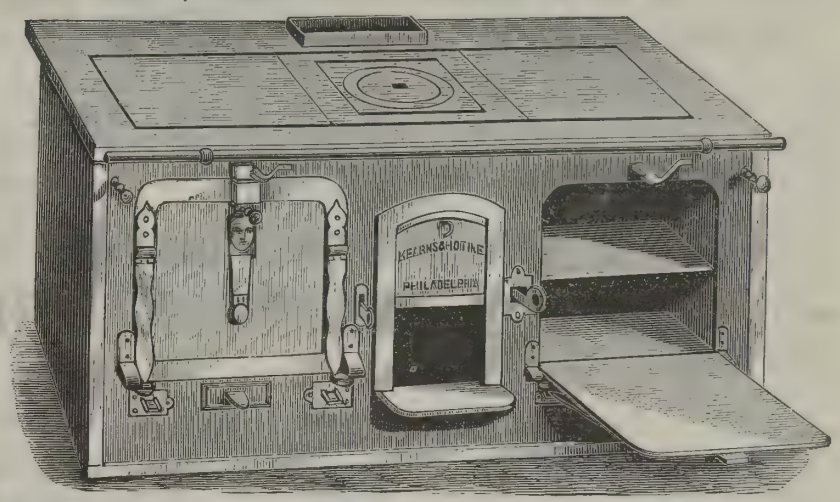

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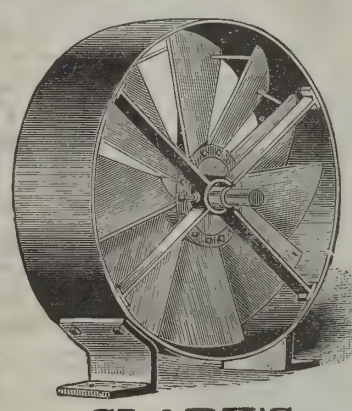

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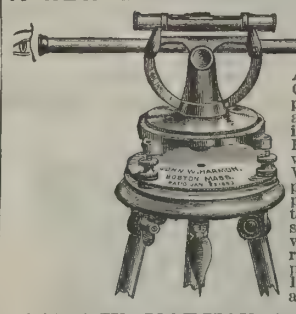

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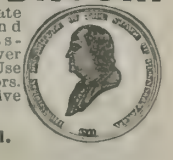

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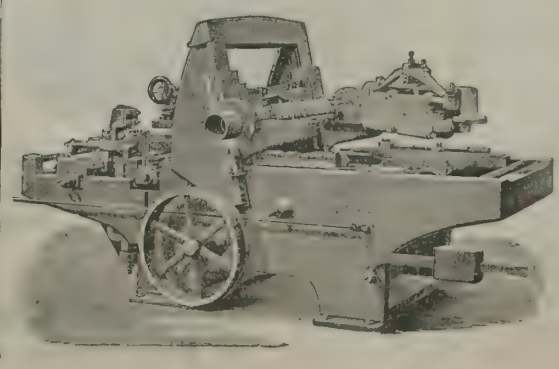

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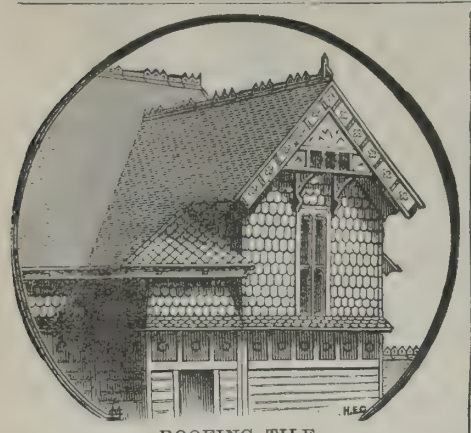

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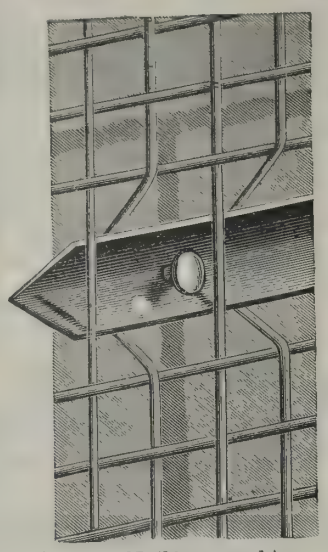

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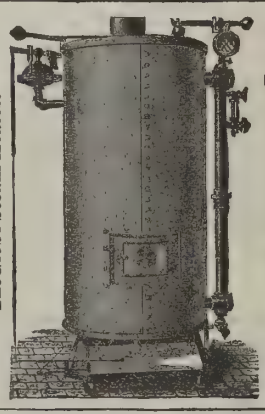

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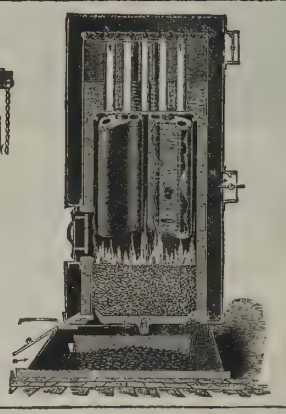

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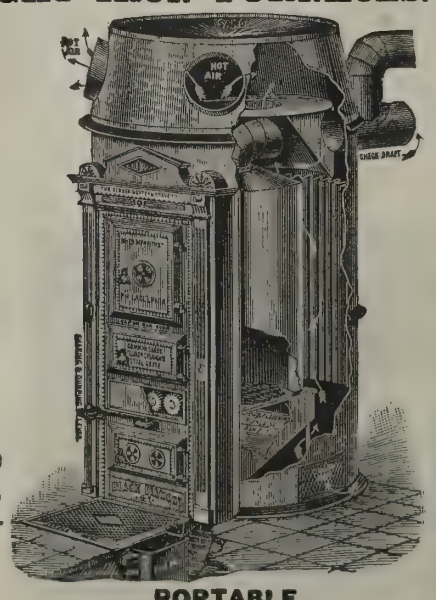

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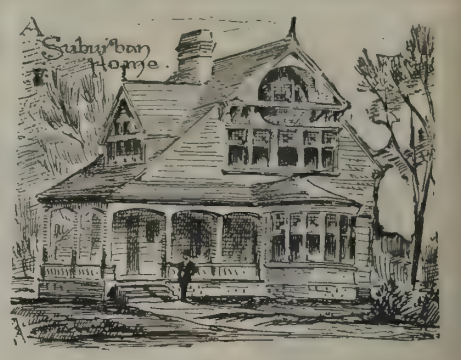

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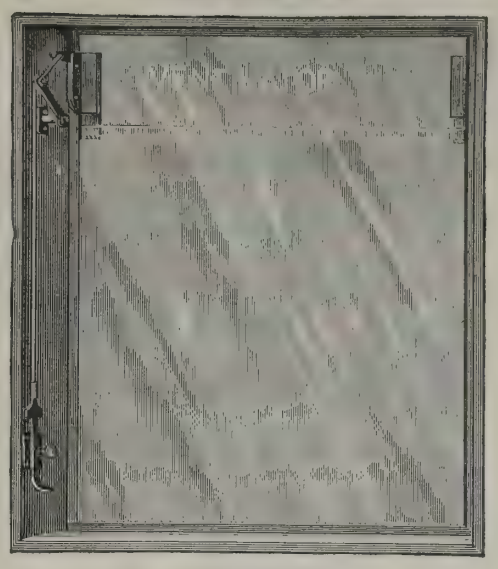

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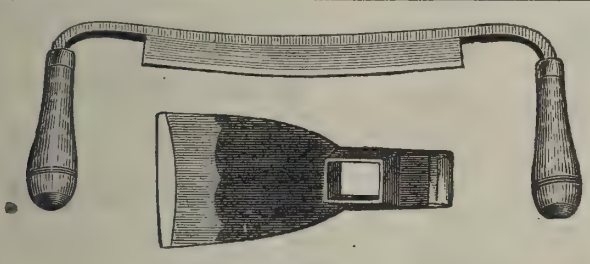

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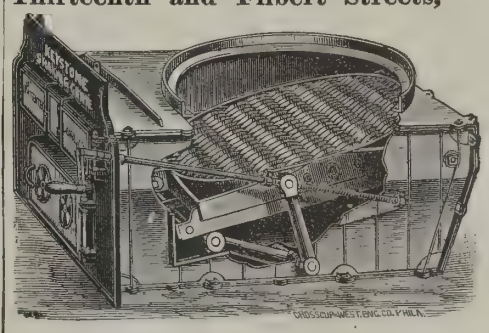

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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(1) T. P. P. asks how blackboard slating is made. A. Use ½ gallon shellac varnish, 5 ounces lampblack, 3 ounces powdered iron ore or emery; if too thick, thin with alcohol. Give three coats of the composition, allowing each to dry before putting on the next; the first may be of shellac and lampblack alone.

(2) S. K. desires a receipt for mending broken marble. A. Take plaster of Paris, and soak it in a saturated solution of alum, then bake it in an oven, the same as gypsum is baked to make it plaster of Paris; after which grind the mixture to powder. It is then used as wanted, being mixed up with water like plaster and applied. It sets into a very hard composition, capable of taking a very high polish, and may be mixed with various coloring minerals to produce a cement of any color capable of imitating marble.

(3) O. S. C. asks a recipe for making a blue stencil paint which will not rub off when used on wood boxes. A. Take of shellac and borax each 2 ounces, boil in water until they are dissolved, then add 2 ounces gum arabic and withdraw from the fire. When the solution has become cold, add enough more water to make 25 ounces, and finish by mixing with Prussian blue sufficient to bring it to a suitable consistency and color.

(4) M. R.—For a French polish, dissolve 12 ounces shellac in 1 quart wood naphtha, add ½ pint boiled linseed oil, thoroughly mix, and rub the furniture with a small quantity on a woolen cloth.

(5) W. S. C. asks some way to remove the soot from a smoke stack 50 ft. tall, that is constantly annoying us by catching fire. Why is it that the soot forms and sticks to the walls of the stack more in the winter than summer? A. You probably burn wood which generates pyroligneous acid vapors, that condense upon the walls of the chimney and cement the unburnt carbon in the smoke. More condensation occurs in winter than in summer, from the greater cold, and hence greater accumulation of soot. There is no remedy but to burn anthracite coal, or sweep the chimney often.

(6) H. B. B.—There is no general proportion of height to length and number of panels applicable in bridge building. The weight to be carried, its kind, whether railroad is single or double track, whether there be also a common road, single or double, or with passenger walks, probable wind force, etc., are prime factors in establishing the height and length of panels. While the length of bridge is always a fixed measure, the quality and strength of material is a modifying and variable factor. In working out the details of strains to meet the requirement of assumed service, engineers may vary the details of construction and proportions to suit their individual judgment.

(7) W. C. T. desires a process by which he can bleach tallow (make it white) without interfering with its use for culinary purposes. A. We recommend simple boiling with its own volume of water, as there is a strong and well-founded prejudice against the use of chemicals.

(8) A. W. W. asks how flowers can be preserved in their natural colors. A. Dip the flowers in melted paraffine, withdrawing them quickly. The liquid should be only just hot enough to maintain its fluidity, and the flowers should be dipped one at a time, held by the stalks and moved about for an instant to get rid of air bubbles. Fresh cut flowers, free from moisture, make excellent specimens in this way.

(9) J. P. McL.—For drying hickory for mallets: Heat in a steam box until the sap is boiled out, then transfer to a dry room or box heated to nearly 200°, and allow to cool slowly.

(10) B. J. D. asks: 1. Will you please inform me of the best means to separate wire nails from the sawdust in which they are tumbled. I use hand sieves, and find it tedious, and it consumes too much time. A. Your question can hardly be considered of general interest. For separating the nails from the sawdust, we recommend a revolving tumbler set at an inclination, with the upper end solid, lower end a sieve of the proper mesh. Feed the nails and sawdust from a hopper spout at the upper end, constantly. The sawdust will work through the sieve, and the nails be discharged from the lower end clean and dry. 2. Also the next best lubricant to oils, in running the wire into the machines, as it requires so much tumbling and sawdust to clean the oil from them, and make them bright for use? A. For a lubricant use strong soap water; pass the nails through boiling water on a wire cloth apron and over a steam coil or other hot surface, and leave out the tumbling and sawdust.

(11) J. L. H. asks: 1. Is there any cement for glassware which will stand hot water? A. Glue to which bichromate of potash has been added, and which has afterward been exposed to strong sunlight, becomes insoluble. The proportions are not very well ascertained, but about 1 part of the bichromate, dissolved in water, and added to a solution of 6 parts of solid glue, answers very well. 2. Is there anything which will take mildew out of white goods which have been washed? A. Wet the spots with a very weak solution of chloride of soda (Labarraque's solution) or of chloride of lime (bleaching fluid) or with chlorine water and wash afterward.

(12) J. F. writes: 1. If I lay down 600 feet of one inch pipe in my rooms, and fire from a coil, what will the amount of expansion of the water be? A. The expansion of water from 46° to 212° is 0·0466 of its volume. The iron pipe also expands, due to the temperature of the water. The expansion of the water in the 600 feet of inch pipe will be about 135 cubic inches. 2. What can I add to the water to keep it from freezing, in case the fire goes out? A. Add one or two pounds chloride of magnesium to the water in the coils to prevent freezing.

(13) S. G. S.—There is nothing but a scraper good for taking off old, scaly whitewash. Bronzing liquid may be a paint made with light colored varnish in which is mixed gold bronze. The varnish may be shellac, mastic, or light furniture varnish thinned with turpentine.

(14) D. S. S. asks: Would you inform us in settlement of an argument as to the best method of gas saving—by closing cocks near the burner or by regulating at the meter? A. In general terms, the further from the burner the regulating is done the better. Gas should be as unobstructed as possible in its path to the point of consumption, so as to avoid eddies, which impair the illuminating power. The only objection to governing or regulating at the meter is, that it does not allow for different elevations of burners, and it does not, when cock regulating is used, allow for the burning of varying numbers of lights. The use of large burners and fewer in number is to be advocated.

(15) J. I. asks: Is it heavier on a horse to pull a load by a 100 foot rope or chain than close to it? A. If the rope or chain is free from friction on the ground, it is easier for a horse to pull a given steady load by the long hitch. Much depends upon the condition or kind of work.

(16) J. J. D. asks: 1. What composition is used by hardware manufacturers to make paper labels adhere to iron, and what is it composed of? A. Use a dilute solution of white gelatine or isinglass, in the proportion of about one to twenty. For receipts of cements see the collection given in Scientific American Supplement, No. 158.

(17) H. W. C. writes: A farmer wishes to know how to construct a cheap and easily handled filter for water. A. Use two stone pots or jars, as shown in the accompanying engraving, the bottom one being a water jar with side hole, if it can be procured; otherwise, if no faucet can be used, the top jar can be removed to enable the water to be dipped out. The top jar must have a hole drilled or broken in the bottom, and a small flowerpot saucer inverted over the hole. Then fill in a layer of sharp clean sand, rather coarse. A layer of finer sand, a layer of pulverized charcoal with dust blown out, then a layer of sand, the whole occupying one-third of the jar.

(18) W. M. M. asks for some transparent paint suitable to paint on tracing muslin. A. You must use a transparent varnish such as the following: Dissolve 30 parts of copal and 2 parts of camphor in 120 parts of oil of turpentine and 30 parts of oil of lavender. Use lakes, gamboge, Prussian blue, and the other transparent colors, mixed with the vehicle.

(19) A. H. asks the size of steel wire rope necessary to suspend a weight of 16,000 pounds, each end of the rope being fastened 1,600 yards apart, the weight to travel from one end to the other on the rope. A. The scheme of so long a span carrying a load is impracticable. A span of 4,800 feet will nearly absorb the margin of safety by its own weight, depending upon the amount of deflection that could be allowed in the catenary curve. The largest steel cables that are made, 2⅝ inches, weigh 13 pounds per foot, or over 31 net tons for your span; with a deflection of one twenty-fifth, or nearly 200 feet, the tension would be 3¼ times the weight, or 254,800 pounds, while the ultimate strength is but 400,000 pounds.

(20) W. F. E. asks: 1. How are bath bricks made? A. Bath bricks are found native as minerals, and are imported from England. 2. How are papier mache ornaments moulded, and where can I procure a work on the subject? A. We can send you Spons' "Workshop Receipts" for $2.00, first series, which contains full information on papier mache. See also various articles in Scientific American Supplement on the technology of the paper trade.

(21) D. B. wants a receipt for a dark cherry stain for a white pine floor. A. Use rain water 3 quarts, annatto 4 ounces; boil in a copper kettle till the annatto is dissolved, then put in a piece of potash the size of a walnut; keep it on the fire about half an hour longer, and it is ready to bottle for use.

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Summary of Report.

BUSINESS OF 1886.

Received in Premiums	$15,507,906.04
Received in Interest, Rents, etc.	3,722,502.24
Total Income	**$19,230,408.28**
Paid Death-claims	$2,757,035.97
Paid Endowments	559,075.01
Paid Dividends, Annuities, and for Policies Purchased	4,311,119.11
Total Paid Policy-holders	$7,627,230.09
New Policies Issued	22,027
New Insurance Written	$85,178,294.00

CONDITION JAN. 1, 1887.

Cash Assets	**$75,421,453.37**
*Divisible Surplus, Company's Standard,	$8,080,527.25
†Tontine " " "	4,176,425.25
Total Surplus, Co's Standard	$12,256,952.50
Surplus by State Standard (4½ per ct.)	$15,549,819.58
Policies in Force	97,719
Insurance in Force	$304,878,540.00

PROGRESS IN 1886.

Excess of Interest over Death-losses Paid	$965,466.27
Increase in Income	3,109,285.54
Increase in Surplus, State Standard	2,384,272.59
Increase in Assets	8,557,182.05
Increase in Insurance Written	16,656,842.00
Increase in Insurance in Force	44,699,040.00

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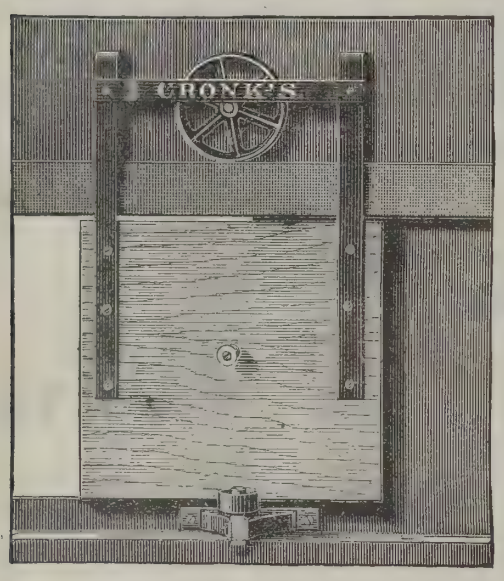

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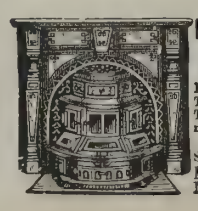

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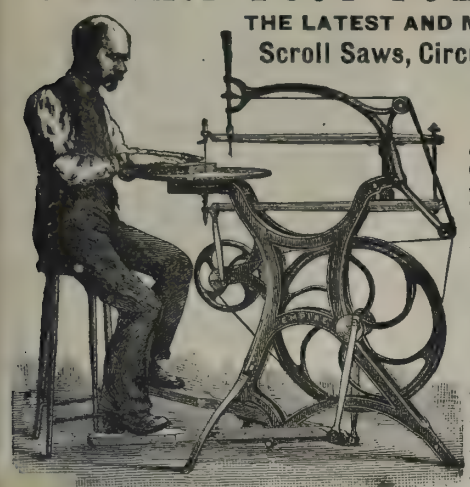

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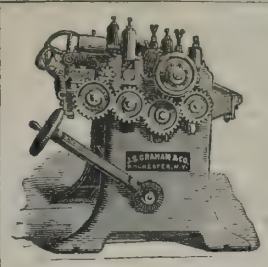

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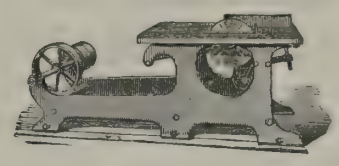

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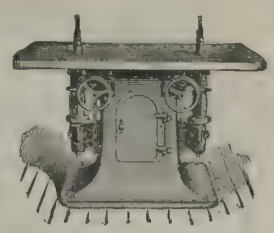

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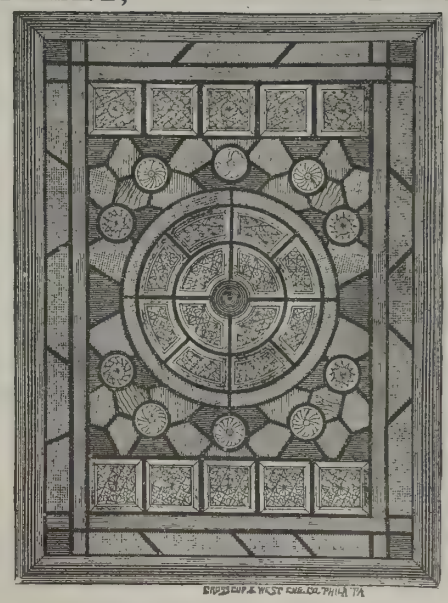

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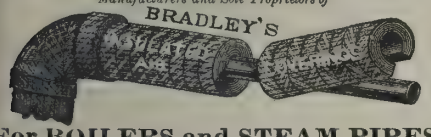

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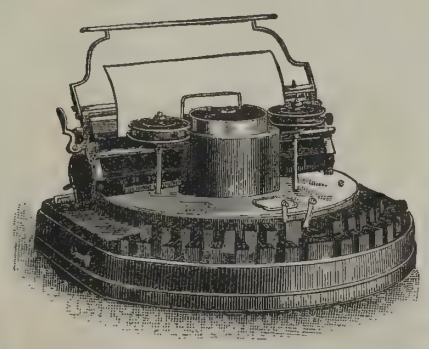

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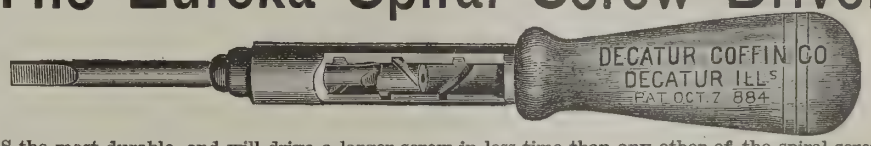

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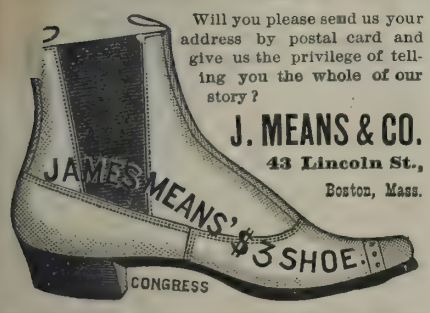

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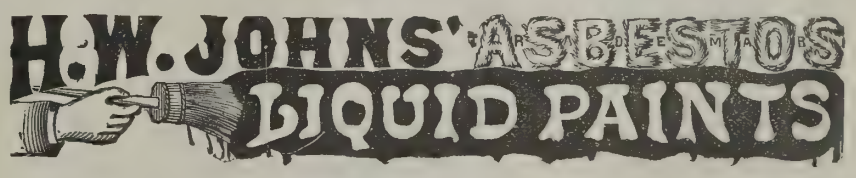

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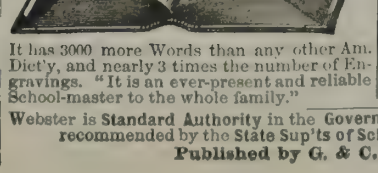

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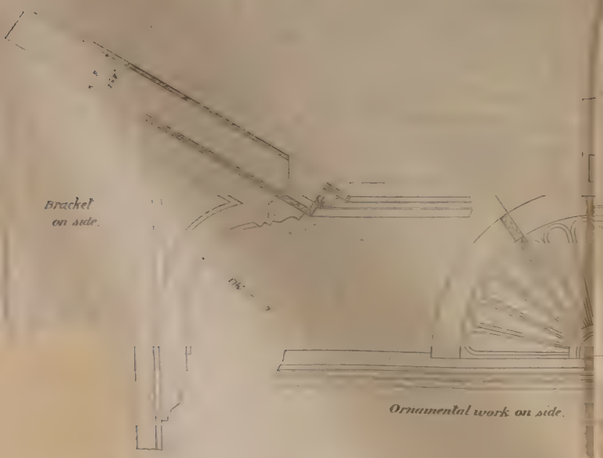

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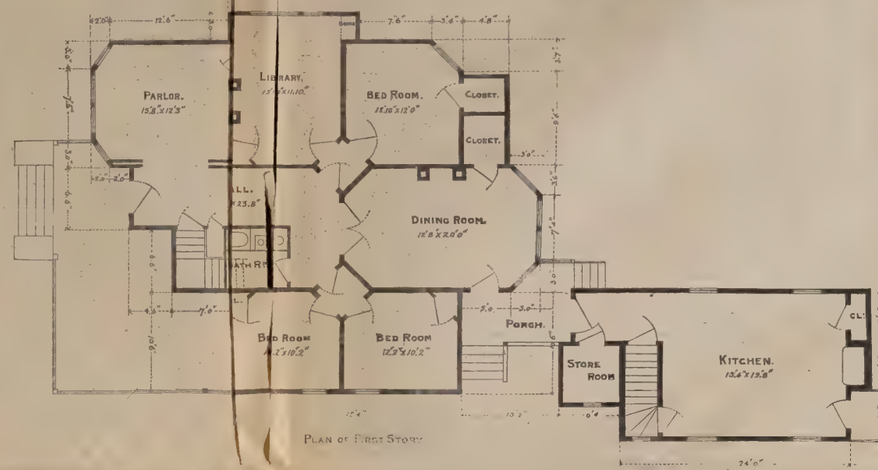

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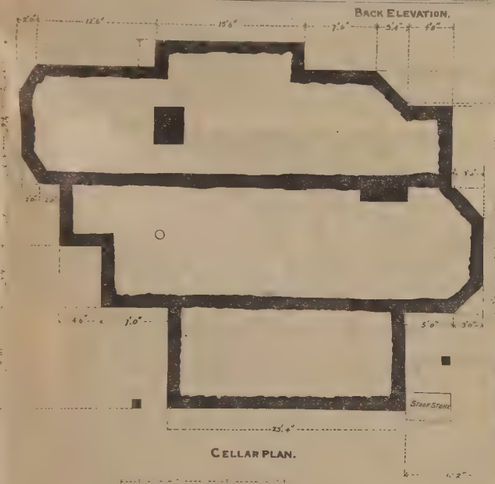

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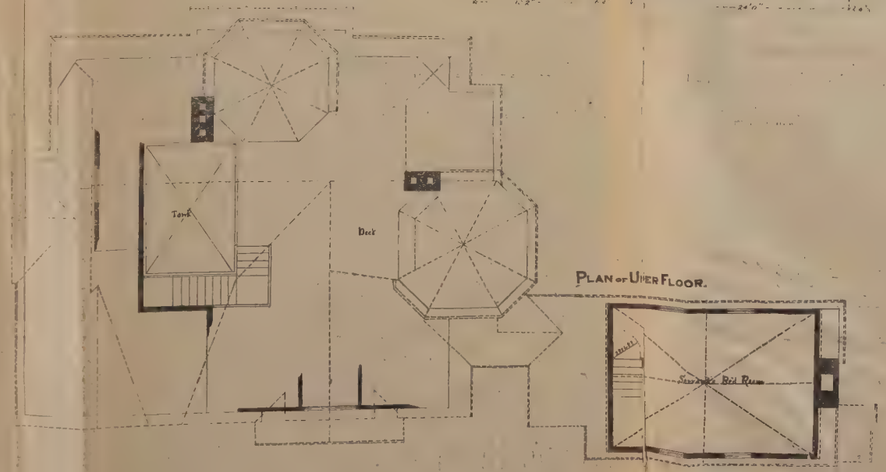

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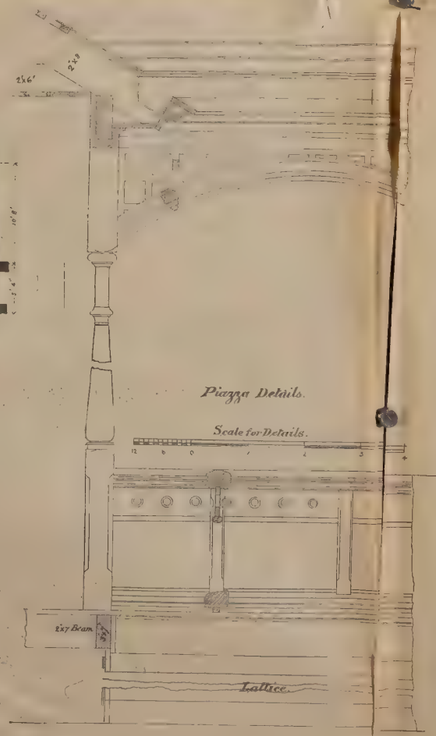

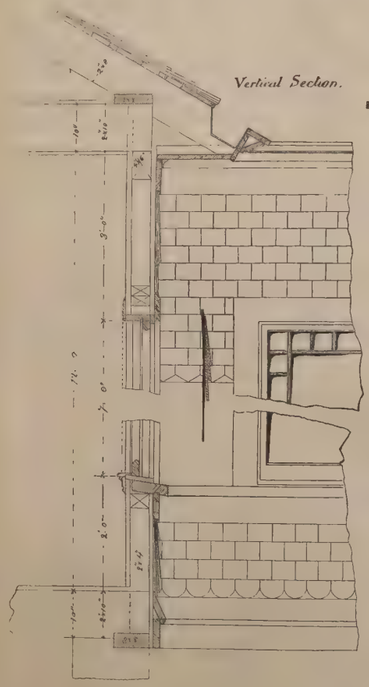

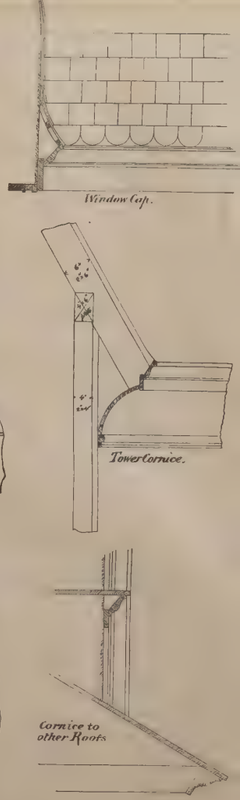

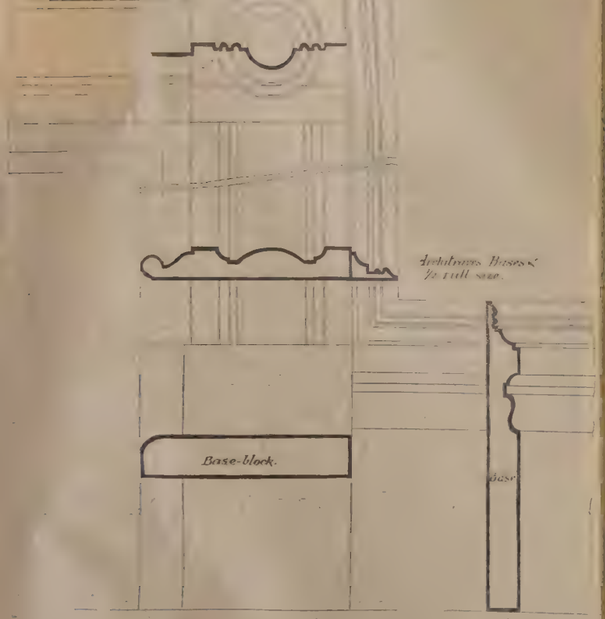

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Christopher Myers, Architect,

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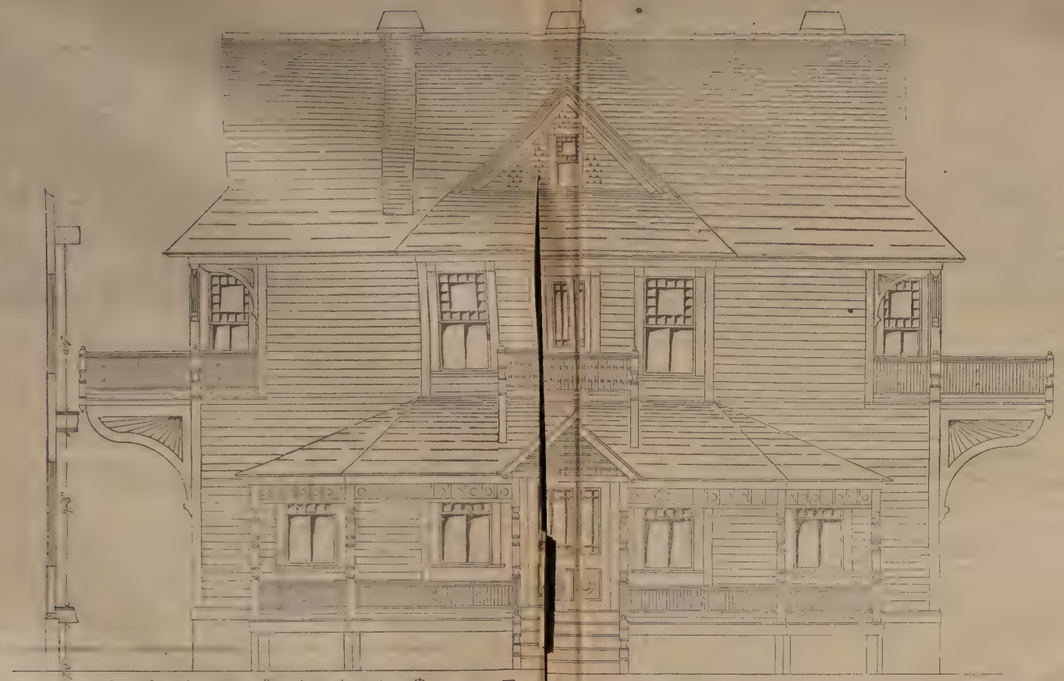

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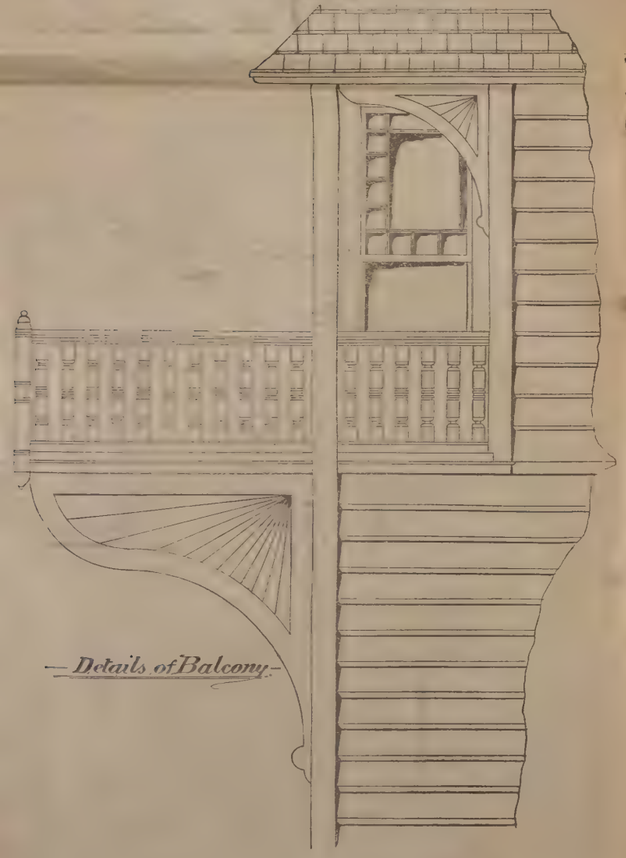

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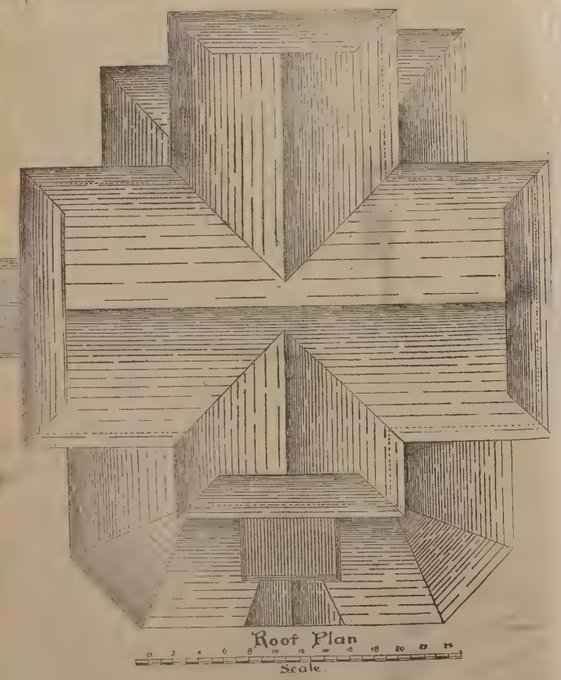

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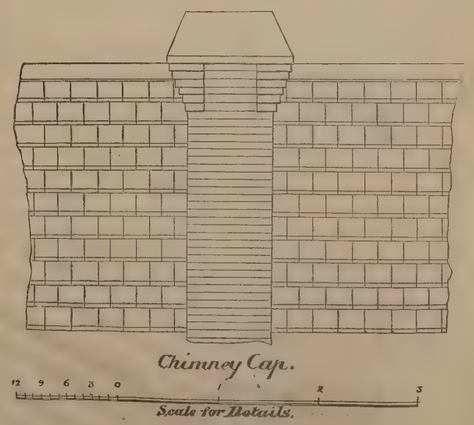

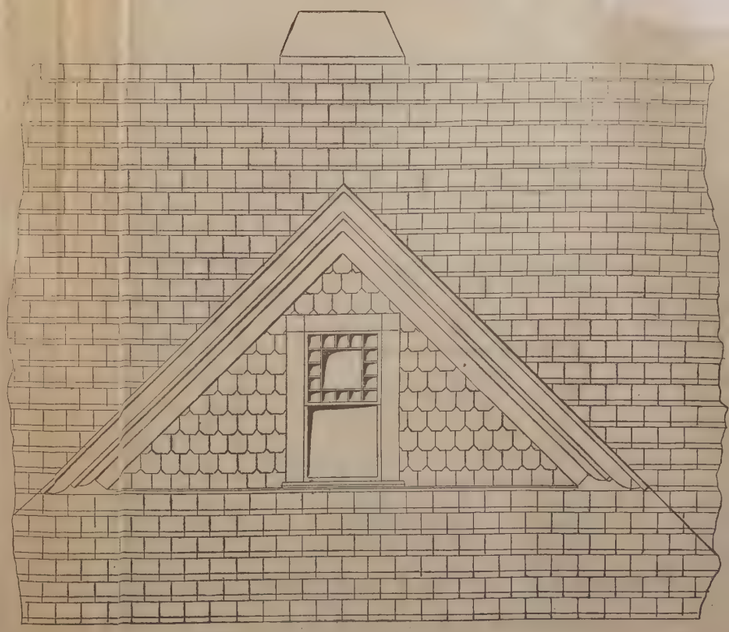

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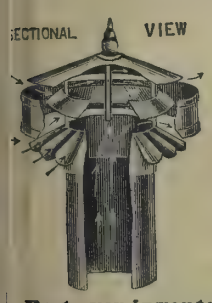

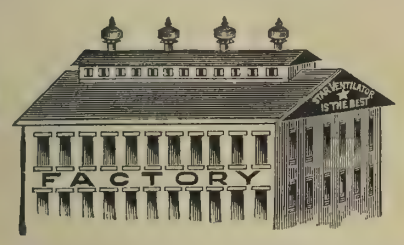

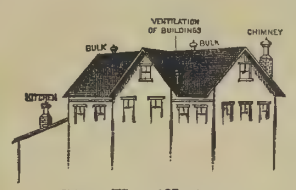

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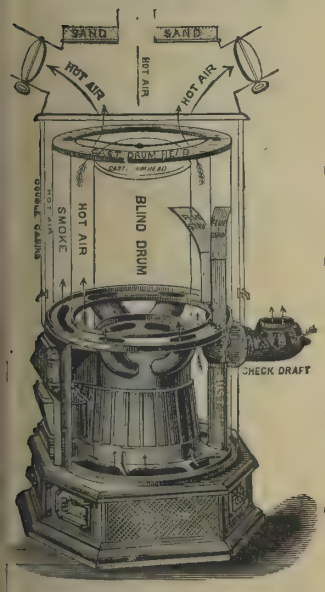

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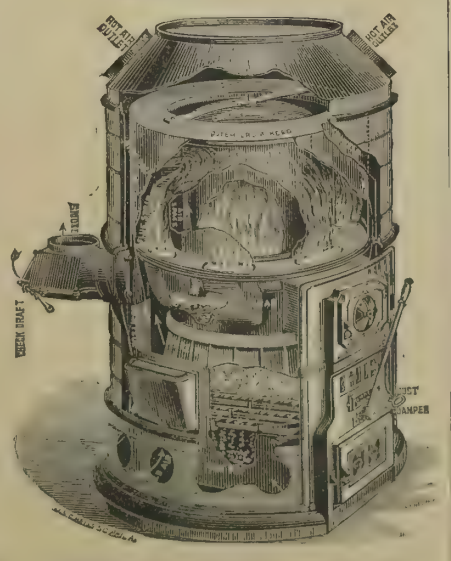

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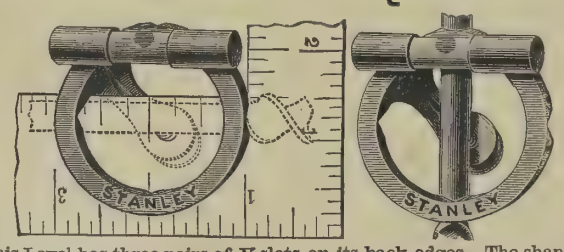
Price, 

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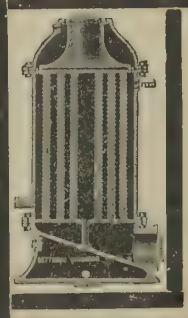

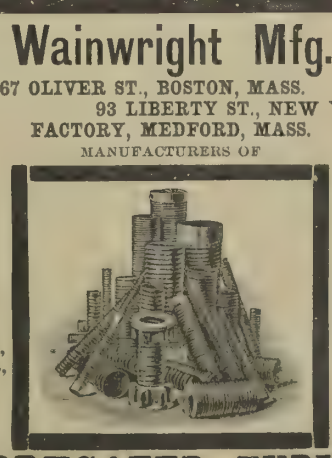

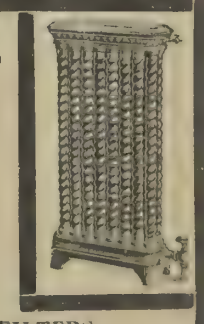

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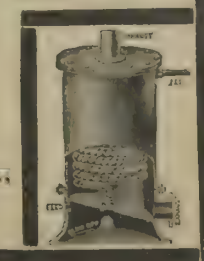

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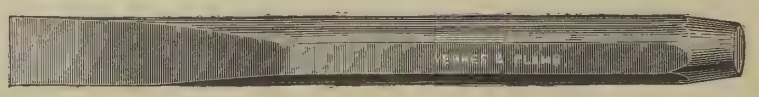

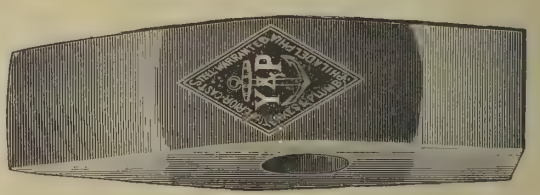

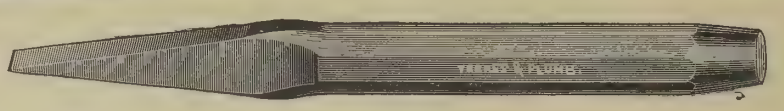

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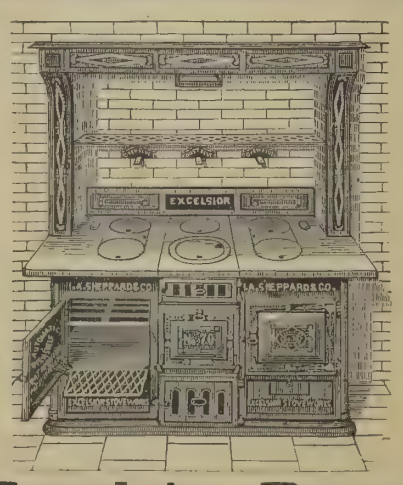

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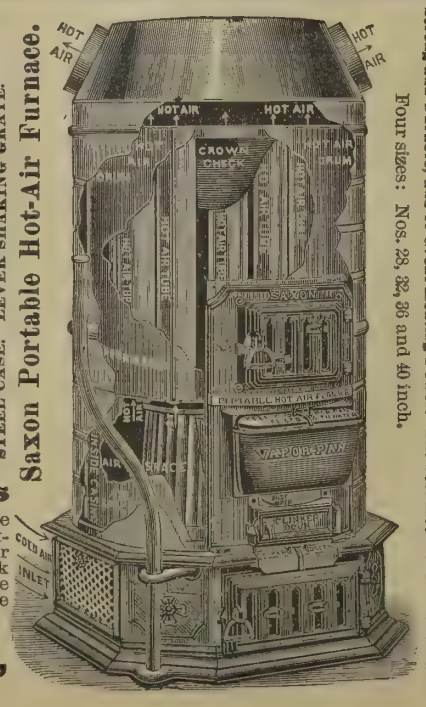

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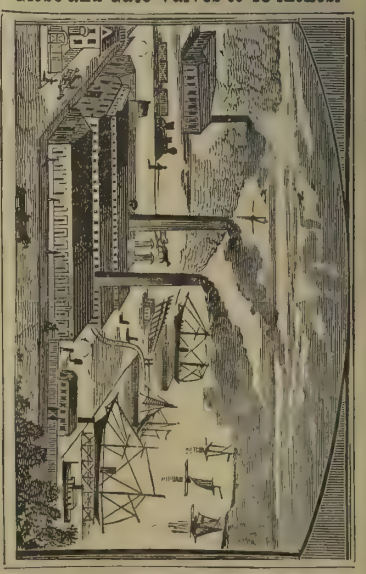

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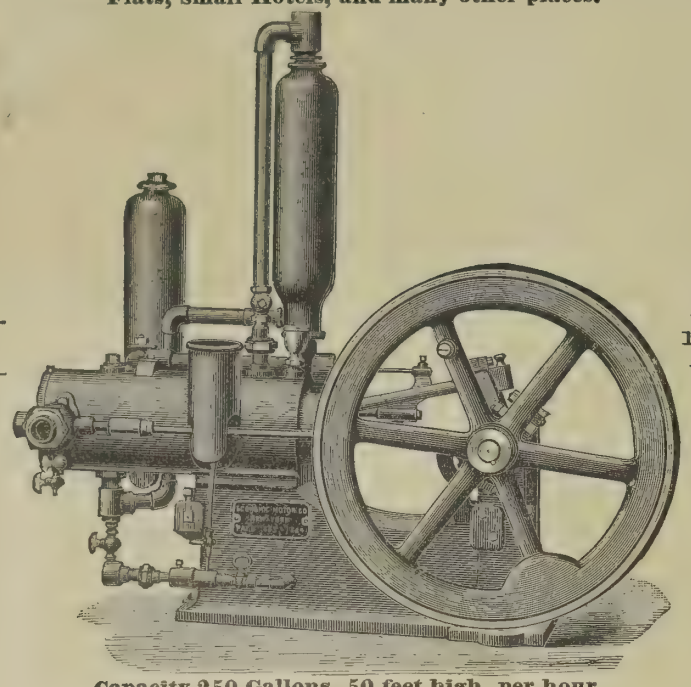

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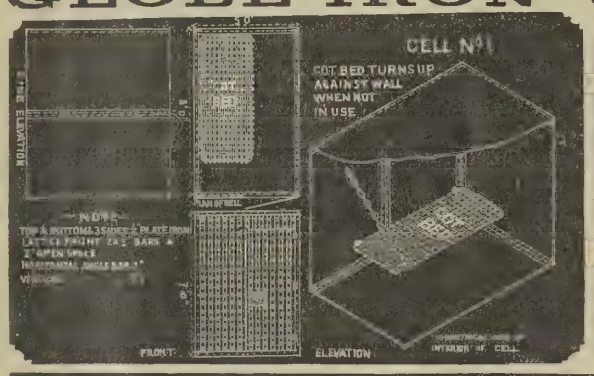

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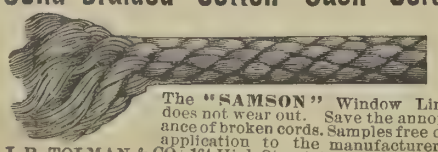

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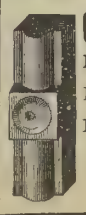

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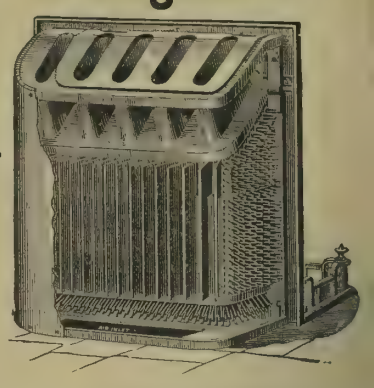

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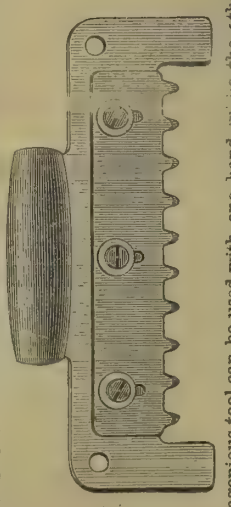

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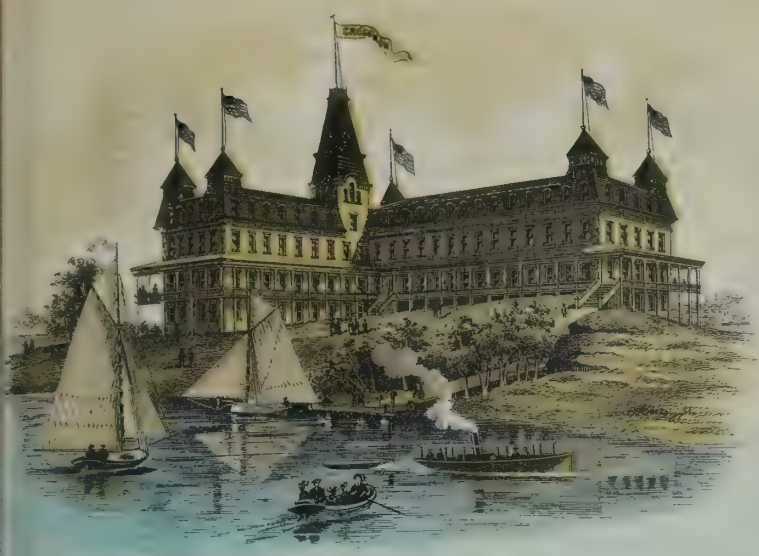

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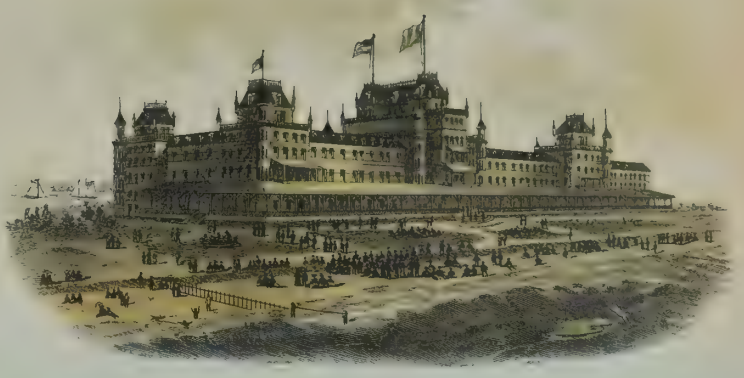

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MARINE & STATIONARY ENGINES,
Wheeling, W. Va.

GENTLEMEN:—We take pleasure in adding our approval to that of the numerous other users of your Paints and Roofings. We have used your Roofing on our river boats constantly for the past ten years, and have yet to find any which did not give perfect and superior satisfaction. This season we have used your Paints exclusively, for inside and outside work on five boats, and have gotten much better results than ever before with other paints; the last boat we sent away was the whitest boat, for a new one, we have ever seen. While the first cost is greater we think the expenditure amply justified from the increased durability and better preservation.

Very respectfully,
A. J. SWEENEY & SON.

FABYAN HOUSE, WHITE MOUNTAINS, N. H.
Painted with H. W. Johns' "Asbestos" Liquid Paints.

We respectfully call attention to our "ASBESTOS" LIQUID PAINTS, which we offer as the best ever produced for general structural purposes.

The finest public and private buildings and most extensive structures in this country are decorated with these paints—among others, the U. S. Capitol at Washington, U. S. Light Houses, Life Saving Stations, Navy Yard and Government buildings generally, the Metropolitan Elevated R. R. of New York, the largest Seaside and other Hotels, etc., as well as thousands of the better classes of dwellings everywhere.

Owing to their wonderful "covering" capacity and superior durability, *due to the purity of materials used, and to our special processes of manufacture*, these Paints are more economical than the "cheap" paints with which the market is flooded *and with which we do not compete.*

We make but one quality, *i. e.*, the best which can be produced from the best and purest materials known for the purpose.

Descriptive Price Lists with samples of the most approved modern shades and colors, with designs and "suggestions for exterior decoration," mailed free on application.

It is a well known fact that the average cost of *applying* paints is from three to four times as much as the cost of the material; it is therefore false economy to use an inferior article, even at a saving of a few cents per gallon.

It is also worthy of note that a plain and inexpensive house can be made an object of beauty by artistic decoration with pure colors, while the architectural symmetry of an ornate mansion may be ruined by an opposite treatment.

H. W. JOHNS' TRADE ASBESTOS MARK MATERIALS.

H.W. Johns' Asbestos Roofing.

This Roofing is the perfected form of portable Roofing, manufactured by us for the past twenty-eight years, and is now in use upon roofs of Factories, Foundries, Warehouses, Cotton Gins, Chemical Works, Railroad Bridges, Cars, Steamboat Decks, etc., in all parts of the world.

It consists of strong canvas, combined with an Asbestos-coated felt, and a manilla lining, or "backing," water-proofed and compressed into a compact, flexible sheet, resembling leather.

It is supplied ready for use in rolls, and is packed in cases suitable for shipment to all parts of the world. It weighs with Coatings complete, including packages, only 85 lbs. to 100 sq. ft.

It forms a neat, cool and reliable roof; is adapted for steep and flat roofs in all climates, costs only about half as much as tin, and can be readily applied by any one, no heat or special tools being neeessary.

Asbestos Roof Coating. This is a fibrous COATING, composed of ground ASBESTOS and Silica, combined with partially distilled coal-tar and an acid and water-proof composition, and is prepared ready for use, to be applied with a brush. It forms the most durable and economical Coating ever produced for Felt and Canvas Roofs. In all size packages from 1 to 50 galls.

Asbestos Roof Cement. This CEMENT is prepared ready for use, and forms an elastic, adhesive compound of a proper consistency to be easily applied with a trowel. It is used for repairing leaks around chimneys, dormer windows, sky-lights, scuttles, etc., on *all kinds* of Roofs; broken joints, nail and rust holes in *Tin Roofs*, etc. *Full instructions on every package.*

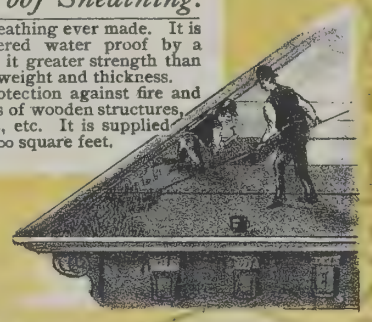
Old leaky roofs can be restored and rendered serviceable for many years with this CEMENT and our ASBESTOS ROOF PAINT.

In 5, 10, 25 and 50 lb. Cans and Pails.

Asbestos Fire and Water Proof Sheathing.

This is the only strictly *Fire and Water* Proof Sheathing ever made. It is composed exclusively of pure Asbestos, rendered water proof by a recently discovered chemical process, which gives it greater strength than any other Asbestos Sheathing or Felt of twice its weight and thickness.

Its value will be readily appreciated as a protection against fire and water for sheathing or lining under weather boards of wooden structures, Shingles, Slate, Floors, Partitions, Walls, Ceilings, etc. It is supplied in rolls 36 inches wide, and weighs only 4 lbs. to 100 square feet.



H.W. Johns'
Asbestos Steam-Pipe & Boiler Coverings

Our Asbestos Cement Felting is the most effective non-conducting Cement Covering for Steam Pipes, Boilers, Stills, and other steam-heated surfaces. ASBESTOS *HOT-BLAST* CEMENT FELTING for Fire-heated Surfaces, Hot-Blast Pipes, etc. It can be easily applied by any one. In Bbls. ready for use.

Asbestos Air-Chamber Covering consists of our fire-proof Asbestos Lining Felt, Hair Felt and our Asbestos Sheathing, forming the lightest and most effective non-conducting Covering known for Steam-Pipes, Boilers, etc. In Rolls, easily applied.

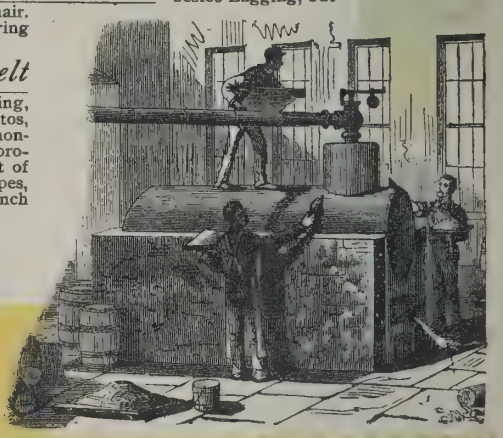
Asbestos Locomotive Lagging, made of strictly pure Asbestos, forming a strong, matted, felt-like material about half an inch thick, of great non-conducting power. It is fire and acid-proof and practically imperishable.

☞ This is the only substantial non-conducting Covering for Boilers and Pipes on steamships which is absolutely fire-proof. It can be removed and replaced without injury.

Asbestos and Hair-Woven Felt is similar to our Asbestos Lagging, but contains 25 per cent. of best hair. and is equally desirable for covering Steam Pipes and Boilers.

Asbestos Lining Felt

consists of pure Asbestos Sheathing, combined with "flocked" Asbestos, forming a strictly fire-proof, non-conducting lining for Hair Felt, protecting it from the injurious effect of heat when applied to Steam Pipes, Boilers, etc. In rolls, 6 to 36 inch wide, easily applied.



H. W. Johns' Fine Colors, in Oil These are prepared from pure colors ground in pure linseed oil, and are superior in quality and fineness to any others for general decorative purposes. All the usual colors, in 1, 2, 5, 10 and 25 lb. Cans.

H. W. Johns' Fine Coach Colors. These colors are ground in best Coach Japan, are warranted uniform in quality and color, and will dry flat and even at once. In Tubes, and in 1 lb. Strip Cans, and 5 and 10 lb. Press Cans.

Asbestos Wood Filler. This is a superior article ground in best gold size Japan, and is offered as the best Wood-filler in the market. The mineral of which it is composed being indestructible, its value as an unchangeable Wood-filler is apparent. Dark, Light, and Mahogany, in 1, 2, 5, 10 and 25 lb. Cans.

H. W. Johns' Wood Stains. These Stains are prepared in pure Gold-Size Japan from the best pigments only. They are put up in form of a stiff paste, to be thinned with turpentine only, and, taking into consideration their covering capacity, are the most economical stains in the market. Mahogany, Cherry, Walnut, and Ebony, in 1, 2 and 5 lb. Cans.

H. W. Johns' Iron-Oxide Paint Is especially adapted for painting and preserving Roofs, Barns, Fences, Bridges, Outbuildings, and all kinds of Iron, Tin, Brick, or Wood work. In color it is a rich maroon, is ground very fine, mixes readily with raw or boiled oil, and forms an elastic, durable Coating that will neither crack nor chalk. Dry, in Bbls. and Half Bbls.; Ground in Oil, in 25, 50 and 100 lb. Pails and Kegs.

H.W. Johns' Varnishes,
for Structural and Household Purposes.

Outside Finishing Varnish. This Varnish is made of the best materials, and is intended for the best outside work where a good surface has been prepared for it, and where the most durable finish is desired; such as outside doors, window frames, signs, etc. It is also a superior Finishing Varnish for coach bodies.

Inside Finishing Varnish. This Varnish is prepared expressly for inside work of houses finished in hard woods, and for the best cabinet work. The first and second coats should be rubbed down with hair, or, on fine work, with pumice stone; the last coat may be left bright or rubbed down to a dead finish as desired.

Extra Coach Varnish. Is used for the same purposes as our Outside Finishing Varnish, but dries harder. It is adapted for all ordinary outside work, and will be found unsurpassed for Wagons and Gears; also for inside work, over grained woods, etc. The best results are obtained when two or three days can be given it to harden.

Extra Furniture Varnish. This is a superior light-colored Varnish suitable for ordinary cabinet work, and is especially adapted for painted furniture, light woods, etc.

Also Brown Japan, Coach Japan, Damar, Copal, Spar Composition, Wood Preservative, etc.

H. W. Johns' Liquid Dryer. This article is warranted superior to any Dryer in the market in siccative qualities, lightness of color and uniformity. It possesses double the strength of any other Liquid Dryer, is suitable for all linseed-oil paints, and will not discolor the most delicate tints.

TO CONSUMERS.—Our materials are prepared ready for use, and can be readily applied without the aid of skilled labor. We will give special prices to manufacturers and other large consumers wherever our goods are not kept on sale.

Samples, descriptive price list, and any further desired information will be promptly furnished.

TO GENERAL MERCHANTS.—In towns where our goods are not already on sale, we purpose establishing their sale as early as may be practicable, and we ask you to send for our descriptive list, which comprises many well known articles for Household, Structural and Mechanical purposes, which are constantly wanted everywhere.

We believe no other manufacturing house can offer a more desirable line of goods of solid practical value, or one which would form so complete a basis for a profitable business all the year round.

We give exclusive sale of such of our goods as dealers will keep in stock and if desired we will send you our Descriptive Price List, and confidential terms.

H. W. JOHNS MANUFACTURING CO. { 87 Maiden Lane, New York. 175 Randolph St., Chicago. 170 & 172 N. 4th St., Philadelphia. 88 Leadenhall Street, London.

SCIENTIFIC AMERICAN

Entered at the Post Office of New York as Second Class Matter.

ARCHITECTS AND BUILDERS EDITION.

Vol. III. Subscription, $2.50 a Year. NEW YORK, APRIL, 1887. Single Copies, 25 Cents. No. 4.

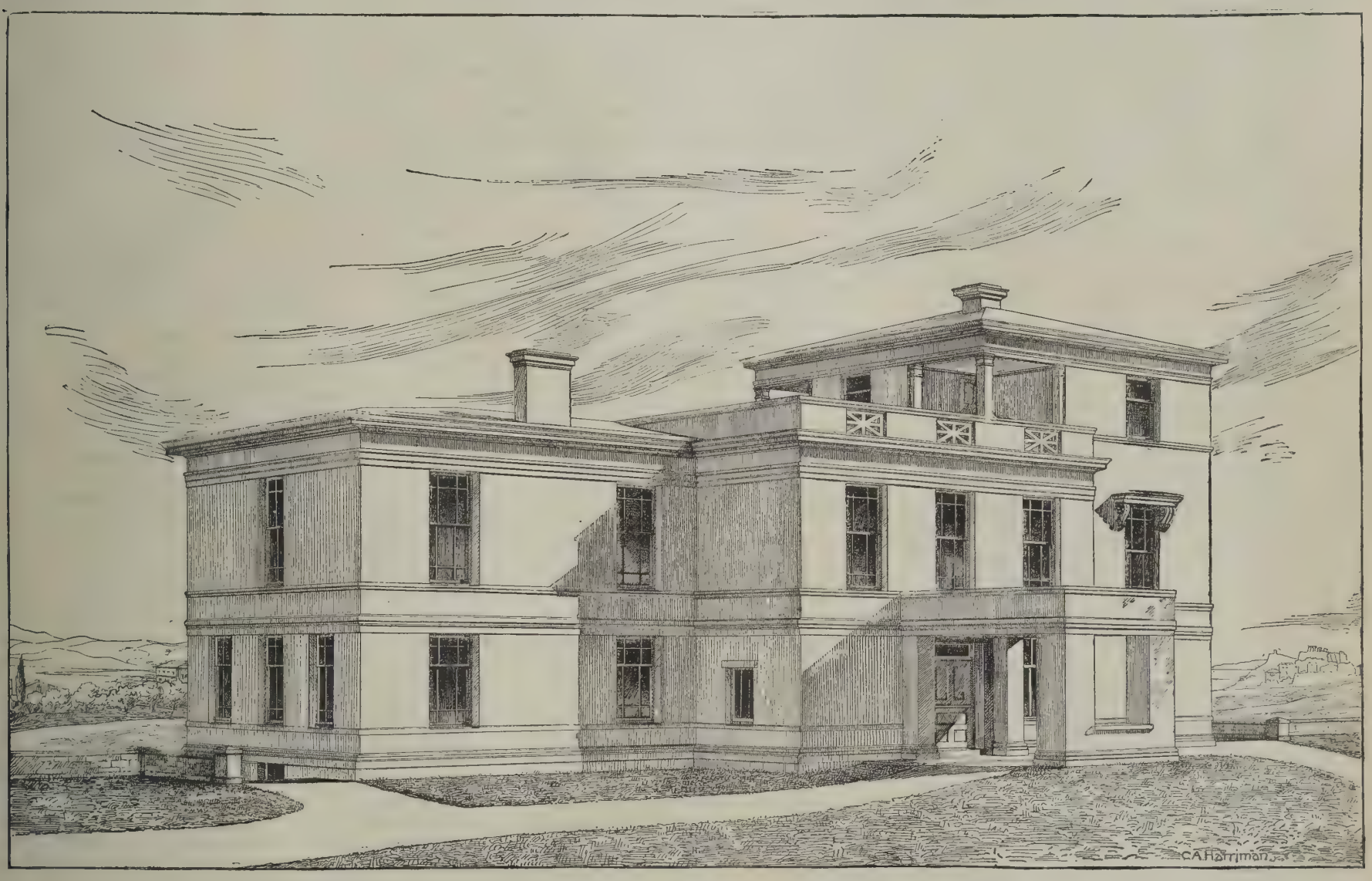
THE AMERICAN SCHOOL AT ATHENS.

In presenting a view of the building now erecting for the *American School of Classical Studies at Athens*, we desire to call attention not so much to the building itself as to the enterprise of which it is to be the seat. It is an undertaking of which every American may be proud, whether he regards the noble ends it has in view or the distinctively American method in which it is carried on. While other nations have founded in Greece schools for special archæological research, France having its school and Germany its institute, the American school aims to quicken, from the original fountain head, all those currents of life which had their origin in Greece, and which constitute the intellectual life blood of modern civilization. Here the student of the history, art, and literature of antiquity may, upon the field of their first triumphs, learn the better to understand them in making acquaintance with the scenes amid which they arose and the objects of which they treat. The country itself is the subject matter of a history and literature which can never be fully understood, and hence never taught with fullness of understanding, unless a visit to Greece has made it familiar. This, at any rate, is the testimony of those who have tried it. Says Professor Goodwin, the first director of the American school: "The whole literature of Greece is full of passages which can be fully appreciated only when they are read or remembered on the spot, in full view of the scenes which they describe. Where else than in Athens can the noble verses of the Attic poets, in which they celebrate their beautiful home, be so thoroughly understood? The historic scenes on which one looks down from Mount Pentelicus are far more vivid to the eye than years of study can make them We have here unfolded before us a map of Attica such as no Kiepert can draw for us. . . . What a change is effected in every student's mind when first he can substitute the glorious panoramas which he beholds from the Attic Hills, from Ægina, or from Salamis, for the maps which have hitherto represented these scenes to his mind!"

These advantages are even greater to the student of art, achæology, and architecture than to the student of history and literature, the matchless remains of art with which the country is covered surpassing nature itself in interest and charm. But Greece is the most inacessible of European countries, and hitherto these privileges have been enjoyed only by an occasional student, traveling well out of the beaten path, to find himself without guidance or companionship in a field where guidance and companionship are specially needed. This want the American school will now supply. That the want has been felt, and that an actual demand exists for just these opportunities, the brief experience of the school has already sufficed to prove. Over a score of students have already availed themselves of its privileges. "These students," says a writer in the *Century Magazine*, "are now instructors and investigators in their own land, and have brought back the enthusiasm for their work which is so strengthened by the seeing of the eye, the touch of the hand, and a general experience of classic lands. One of them, by the generosity of Miss Wolfe, was enabled to extend his researches to Asia Minor, from which he brought away a collection of over nine hundred inscriptions, which, in the opinion of the great European epigraphists, is second to no other in historical value, and will, when edited and published, add great luster to American scholarship in the person of Doctor Sterrett."

The school is now supported by the annual contributions of no less than sixteen American colleges, which take turns in sending out an Annual Director. But it is obvious that this is but a temporary experiment, to try the ground; and the trustees of the school, of which Mr. James Russell Lowell is chairman, are proposing presently to obtain for it an endowment sufficient to support a Permanent Director. Dr. Charles Waldstein, of New York, now Director of the Fitzwilliam Museum at Cambridge, England, will become director of the school in the autumn of 1888, provided a sufficient sum is secured by that time.

The building contains a home for the Director, and in a wing, shown on the left of the drawing, rooms for half a dozen students, more or less, on the lower floor, and above, a large library. For this, fifteen hundred carefully selected volumes are already in hand. Close by is the English school, founded in imitation of our own, and already ready to enter into friendly rivalry with it. The best relations obtain between the two schools, the students of each frequenting the exercises of the other. As the director of the British school is the eminent architect, Mr. Penrose, it will be seen that for students of architecture the opportunities of study now opened are beyond all comparison with what has hitherto existed. The design for the American school was prepared by Professor Ware, of Columbia College, and the building is going up under the supervision of Mr. S. B. P. Trowbridge, a graduate of the Department of Architecture in the School of Mines, and now a student in the Athens school. It will be finished during the coming summer. It stands on the southern slope of Mount Lycabettus, on the eastern outskirts of the city, in ground given to the school by the Greek government, and commands a prospect of surpassing beauty.



THE AMERICAN SCHOOL OF CLASSICAL STUDIES AT ATHENS.

Strength of Brick Walls.

The question of strength of brick walls is often discussed, and differences of opinion expressed. The following is one of the rules given: For first class buildings, with good workmanship, the general average should not exceed a greater number in height than three times its thickness of wall in inches, and the length not to exceed double the height, without lateral supports of walls, buttresses, etc., as follows, for safety:

Thickness.	Safe Height.	Length.
8½ inch walls	25 feet.	50 feet.
13 "	40 "	80 "
17 "	55 "	110 "
22 "	66 "	130 "
26 "	78 "	150 "

Where the lengths must exceed these proportions, as in depots, warehouses, etc., thickness should be increased, or lateral braces instituted as frequently as practicable.

Scientific American.

ESTABLISHED 1845.

MUNN & Co., Editors and Proprietors,

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

NEW YORK, APRIL, 1887.

THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

This is a Special Trade Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book pages, forming, practically, a large and splendid **Magazine of Architecture,** richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

Back Numbers.—At present we are able to supply to new subscribers all the back numbers of this journal from its beginning, in November, 1885. Each number is accompanied by a sheet of colored plates and a sheet of details. Price 25 cents per copy.

Bound Volumes.—Volumes 1 and 2, being for the year 1886, including the whole work, from beginning to close of past year, may now be obtained at this office, or from Booksellers and Newsdealers. Price, bound in paper, $1.50 per volume. Two volumes per year. Forwarded to any address.

Including all the separate diagrams and engravings of construction details, the two volumes present not far from two thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work. It is full of useful information, and its illustrations have a permanent value for suggestion and reference. It never grows old or useless.

MUNN & CO., Publishers,

361 BROADWAY, NEW YORK.

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A COTTAGE ADAPTED FOR FUTURE ENLARGEMENT.

A problem of almost every day occurrence is the alteration and enlargement of existing buildings. A dwelling may be erected by a man for the accommodation of his small family, and a few rooms be quite sufficient for his wants. But, with increasing years, his family augments, and he finds it necessary to either build a new house or to enlarge his old one. There are, generally, many reasons why he should do the latter. The individual and family associations connected with the old house render him anxious to preserve it in detail as far as possible. Then, on the score of economy, he will wish that the old structure should be utilized.

To make extensive additions to a house under these circumstances is not, as a rule, easy; but that, with a little foresight, provision may be made for such a contingency, is shown by the design represented in the colored plate accompanying this number.

Here we have a house complete in itself, and pleasing in appearance, which may be readily added to without in any way interfering with the existing building, or necessitating the waste of material. This would be effected by building on the left hand wall. Exactly how it is proposed that it should be done will be shown by full drawings in a future number. As it is now represented, the little house would be a convenient and attractive one.

Below is an estimate and bill of quantities, showing the cost of the house to be $1,819.37. These prices are based upon the high current value of labor and materials in New York and its vicinity. In many localities the house might be erected for a good deal less.

The full specification given below, and the sheet of detail drawings and elevations clearly indicate the precise construction of the building.

This design has been specially prepared for the SCIENTIFIC AMERICAN by Mr. Christopher Myers, architect.

ESTIMATE AND BILL OF MATERIALS, AS PER SPECIFICATION BELOW.

MASON'S WORK, ETC.

		At.	
92	yards excavating	$0 25	$23 00
43	perches stone	4 50	193 50
	Cement bottom		15 00
2	piers in cellar	3 50	7 00
4	outside piers	3 00	12 00
2	stoop stones	4 00	8 00
2	chimneys complete	37 10	75 00
5	window sills in cellar		4 00
	Cellar steps and copings		20 50
726	yards plastering	40	290 40
	Cistern		40 00
	Cesspool		20 00
	Drains, as specified, complete		20 00
	Total		$728 40

CARPENTER'S WORK.

Timber Bill.

No. of Pieces.	Size.	Description.
1	6″× 8″×20′=	80 trimmer.
3	3″× 8″×12′=	72 sills.
1	" ×16′=	32 "
1	" ×24′=	48 "
1	" ×14′=	28 "
1	" ×30′=	60 "
8	4″× 6″×22′=	352 posts.
2	" ×20′=	80 "
3	4″× 4″×16′=	64 ties and plates.
3	" ×14′=	57 feet ties and plates.
1	" ×24′=	32 " " " " "
6	" ×12′=	96 " " " " "
2	" ×19′=	50 " " " " "
20	2″×10″×16′=	540 " beams.
36	" ×21′=1,260	" "
10	2″× 9″×16′=	240 " "
18	" ×21′=	567 " "
20	2″× 6″×21′=	420 " rafters.
19	" ×16′=	340 " " and coliars.
6	" ×18′=	180 " "
1	3″× 6″×16′=	24 piazza.
1	" ×22′=	33

	4,547 feet spruce at per M. worked	$28 00	$127 32
425	2″×4″×12″ studs = 3,400 feet hemlock	24 00	81 60
800	feet hemlock boards for roof, put on finished	20 00	16 00
800	slates, put on, per foot	7	56 00
2,000	feet sheathing and paper, put up	22 00	44 00
1,500	feet siding, at per M	35 00	52 50
600	" shingles on side, at per foot.	6	36 00
200	" main cornice and gutter	30	60 00
100	" band course	20	20 00
130	" water table and piazza fascia	10	13 00
50	" piazza gutter cornice and plate	30	15 00
2	back piazza columns		3 00
1	short post on back piazza		$2 00
10	feet rail and balusters, back of piazza	$0 20	2 00
13	" filling in back piazza	30	8 90
2	turned columns front piazza	2 25	4 50
1	" short column		2 00
13	feet rail front piazza	30	3 90
6	brackets for same	25	1 50
100	feet piazza floor, ceiling, roof trimmed		25 00
	Stoops, lattice, steps, etc., complete		18 00
7	cellar windows complete		12 25
13	windows on first story	8 00	104 00
11	" " second story	7 00	77 00
4	" " third "	5 00	20 00
2	flights of stairs complete		75 00
	Cellar stairs		4 00
300	feet of surbase		12 00
6	closets complete		18 00
	Front door complete		10 00
7	doors, first story	5 50	38 50
6	" second story	5 00	30 00
4	" third "	4 50	18 00
	Pump and sink		25 00
	Incidental expenses		60 00
			$1,090 97
	Mason's work, as above		728 40
			$1,819 37

SPECIFICATIONS.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, so that any work shown on the drawings, and not mentioned in the specifications, or *vice versa*, is to be executed the same as if both mentioned and set forth, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever. The drawings in connection with this specification are intended to provide for the completion of the entire carpenter, mason, painter, plumbing, slating, tinning work, etc., and everything mentioned in this specification.

Quality.—All materials used to be of good quality, free from all defects impairing their strength and durability. All timber, except where otherwise specified, to be of good, well seasoned spruce.

MASON'S WORK.

Excavate cellar to average depth of about 3 ft., the soil to be put in a separate pile for future use. Other dirt to be roughly leveled off at sides, and in front of house. Cistern and cesspool earth to be left in heaps.

Foundation Wall.—To be 16 in. thick, laid up with quarry stone, of good size, to the height of 7 ft. in the clear. Angles and corners to be plumb and true, perfectly level on top. No footing course under foundation wall. Build and excavate for piazza piers at least 2 ft. 6 in. deep.

Bluestone.—Furnish bluestone sills for all cellar windows.

Stone Walls.—All stone wall to be laid with sharp sand and lime mortar, using small quantity of cement. Stone work to be pointed inside and out. The outside to have cut cement joints. Furnish and set bluestone cellar steps with brick risers and brick walls, and capped on top. Piazza piers to be brick.

Chimneys.—Build chimneys, as shown on plans, of good, hard Jersey brick, laid in good sharp sand and lime mortar. Select best bricks for topping. Chimneys to have Portland cement caps moulded on. Build brick piers under girder.

Lath and Plaster the entire first, second, and third stories. Mortar to be made in best manner for first class work, well put on, hard finish, to be gauged high. First and second stories to be three coat work, to wit, scratch coat, brown, and hard finish. Attic and closets to be laid on and hard finished.

Thimbles.—Furnish and set all necessary thimbles for chimneys.

Stoop Stones.—Furnish and lay on good foundation two good stoop stones of proper size.

Cistern.—Build cistern of common brick, 9 ft. by 9 ft. in clear. Manhole in top, with bluestone to cover. Cement inside in best manner, and warrant perfectly tight. Place stone at bottom for water to strike on.

Cesspool.—Build cesspool, where directed, about 50 ft. from house, of rough stone laid in dry, with stone at top 5 ft. by 6 ft. in the clear. Do all necessary excavation, and lay 3 in. drain tile from foundation wall to cesspool, with cemented joints.

Drain.—Do all necessary excavation, and lay 3 in. tile from discharge of leaders to the cistern. Cement joints, and fit into cistern all complete.

Chimney Flues.—All joints in chimney flues struck smooth. Do all necessary patching after other trades are through, and leave the house in good order all complete.

CARPENTER'S WORK.

Sizes.—Girder to be 6 x 8 in.; sills, 3 x 8 in.; plates and interties, 4 x 4 in.; posts, 4 x 6 in.; first and second floor beams, 2 x 10 in.; third tier 2 x 9 in., all 16 in. on centers; rafters, 2 x 6 in.; hip and valley rafters, 3 x 8 in., 24 in. on centers; all studding 2 x 4 in., 16 in. on centers.

Framing.—Frame the building in the strongest

manner, in accordance with the drawings. All joints to be closely fitted and the frame mortised and tenoned together. Fasten with spruce pins well spiked.

Floor Beams.—Each tier of floor beams to have one row of bridging, accurately cut and well nailed at each end. Beams to be doubled under partitions running parallel. Headers and trimmers all double.

Studding.—All studding placed 16 in. on centers, door and window studs to be double bridged once on each floor. Partition studs to rest on partitions below where possible, and not on the floor beams.

Sheathing.—The entire frame, from sill to plate, to be sheathed with 1 in. rough hemlock boards, put on diagonally, and well nailed at every post and stud. This to be covered with No. 30 Manila building paper, well lapped and laid under door and window frames.

Flooring.—First and second floors to be laid with narrow spruce flooring, well driven together and nailed to each beam. Attic floor to be pine, 9½ in. wide, well driven together and nailed to each beam.

Siding.—Cover entire building, except where otherwise shown in drawings, with sound and clear No. 1 beveled clapboards, 4 in. to the weather, nailed every 16 in., and set nails for putty. Shingle vertical sides where shown with 18 in. xxx pine shingles, laid not more than 5 ½ in. to the weather, and clipped as shown on the plans. Do all necessary furring. Set grounds for all doors.

Roof.—The roof is to be boarded with sound rough hemlock boards. Covered with tar felt. Valleys and gutters to be lined with I. C. charcoal tin, all joints to be carefully soldered. Do all necessary flashing around chimneys, dormers, bay windows, porches, etc. Slate the entire roof with 8″ x 16″ black slate. Put up where required 3 in. tin leaders, connected with drains where directed.

Piazza.—The sill and bearing beams for porches to be 3 x 6 in. Floor beams 2 x 6 in., placed 20 in. on centers, notched into the sill and well nailed. The floors to be 1 in. thick, 4½ in. wide, laid in paint, and blind nailed. Steps to have 1¼ in. treads and 1 in. risers. The roof to be ceiled and tinned. Columns, plates, bolsters, ceiling, etc., to be white pine worked and trimmed as per detail. Piazza ceiled on the under side.

Blinds.—All windows except cellar to have 1¼ in outside blinds, made, hung, and fastened in best manner.

Exterior.—The water table, corner boards, cornices, window frames, bay windows, porches, and all other exterior ornamental work, to be made of the best quality white pine, in accordance with drawings. The ends of rafters overhanging the plate to be worked as per detail.

Window and Door Frames.—Window frames to be made for 1½ in. double hung sash, with 1¼ in. pulley and hanging stiles. 2 in. sills and ⅞ in. sub-sills. 1¾ in. axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted jambs, cased inside and hung at top with 3 in. narrow butts, and proper fastenings. Door frames to be made of 1¼ in. plank with rabbeted jambs. Outside doors to have 1¼ in. casings.

Sashes.—All sashes, except cellar, to be 1½ in. thick. Dimensions and number of lights as showing in plans. To be glazed with second quality French sheet glass. Cellar to be glazed with third quality. The double hung sash to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts. Size and number as per plan.

Doors.—The front doors to be 2 in. thick, moulded, and as per plan. Upper panels to be glazed, hung with 4 in. cast loose butts, fastened with 4½ in. mortise lock, brass face, white porcelain furniture, nickel plated seats and drop escutcheons, brass flush bolts top and bottom. Second floor closet doors 1¼ in. thick, paneled and moulded one side. All other doors, 1½ in. thick, paneled and moulded both sides, hung with 4 in. loose joint butts, fastened with 4½ in. mortise locks, porcelain furniture, etc. Locks for closet doors to be reverse bevel rim locks. All doors, where needed, to have hardwood, rubber tipped stops, and ash saddles.

Stairs.—Build the main stairs as shown on the plan, from first to third stories, with 1¼ in. treads, ⅞ in. risers, 1¼ in. strings of white pine, to be put up in the best manner. The steps wedged. To be supported on strong carriage timbers. Newels, hand rails, and balusters made of ash, as per details.

Trimmings.—The architraves for all doors and windows throughout the house to be made 5½ in. wide, moulded on face. First and second stories to have turned corner blocks in the attic. The bases to be 7½ in. wide, moulded on top, all to be of clear, well seasoned white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on two sides, as directed. Bed room closets to have one shelf with strip, with japanned hooks.

Kitchen Sink.—Kitchen sink to be 18″ by 36″, cast iron, with No. 2 "Douglass" lift pump, fitted and cased properly, with proper suction and discharge pipe complete.

Finials.—Put up metal finials where shown on the elevations. These to cost $3 each.

Generally.—Do all work necessary to completely finish carpenter's work.

PAINTER'S WORK.

All the exterior woodwork usually painted, including privy, to be painted two good coats of white lead and linseed oil paint. All knots and sap to be well shellacked before painting. All cracks, joints, and nail holes, and over nail heads to be well puttied after priming is done. All tin work to have two coats of "Prince's" metallic paint. Also paint the chimneys two coats. All the colors to be selected by the owner. The blinds will be painted at the factory. The interior will be wood filled with "Wheeler's" wood filler, then two good coats of hard oil. Stair rails and balusters will be rubbed down to a smooth surface. All the doors, saddles, hearth borders, and hard floors will be oiled. All sash and outside doors must be painted on top and bottom. The painting to follow immediately after the carpenters.

AN EAST ORANGE HOME.

One of the most admired residences of the many picturesque ones found in East Orange, N. J., is the house of F. W. Coolbaugh, erected last year, on Burnett Street, which forms the subject of illustration in our colored plate and sheet of details in this issue. Located in a slightly elevated position, at a well judged distance back from the road, the house at once gives the impression of being essentially a handsome one. The whole effect is well conceived, and exhibits evidence of much care and thought having been expended upon it, while many of the minor details are of a novel and interesting character.

Coming to the interior, one is immediately struck with the comfortable and homelike appearance and arrangement of the rooms, which open into one another, and are well calculated for the accommodation of guests. The kitchen leads off from the dining room, and a small serving lobby is placed between them, as shown upon the plan.

The hall is very prettily arranged, the construction of the staircase being particularly novel and pleasing. This is executed in hard wood, and is formed with a quarter space, raised three steps up, and approached from two sides, viz., either from the entrance door or dining room, as will be understood on reference to the plan. On the second story four good sized bed rooms are provided, with bath room and ample space for closets and trunks. The top floor contains servants' and other rooms, as represented.

The decoration of the house is carried out in a very superior manner. In the vestibule the walls are covered with stamped paper in imitation lincrusta walton; while the hall is provided with a dado and a filling of embossed paper. Most of the rooms are decorated in well chosen metal hangings, with deep friezes, and the ceilings are finished in light one-colored papers and borders. In several of the windows stained lead lights are used, with charming effect. Some of this work is of a description not often seen, being partly composed of broken pieces of thick colored glass set in the lead work, and giving the appearance of crystals. The design of the lead lights in the window in dining room is shown in our supplementary sheet. Set in the wood work of piazza are several rondels of colored glass, which aid in producing the good effect.

Among the special features in the house which greatly add to its comfort and completeness is a very nicely designed buffet, built in hardwood and fitted in the dining room, in the space underneath the stairs. Fitted wash basins, with marble tops, are provided in the dining and several of the other rooms, there being five in number altogether. A large heater, built in brickwork, is provided in the cellar, with registers in the halls and all the principal rooms, and there are grate fires in the library and parlor in addition. The mantel pieces are of excellent design, and are represented in our sheet of details. Electric bells are fitted throughout in a most complete manner, the servants' call being so arranged that on pressing the button three bells in different parts of the house may be made to ring simultaneously. The drains are all ventilated with cool air spaces, and are built with special openings designed for the purpose of access in case of stoppage.

The cost of the house to duplicate would be about $5,000. Mr. Coolbaugh spent a total of some $6,000 in its erection, the extra sum being expended in decoration and plumbing, both of which are of a very superior kind. The original estimates on the drawings and specifications did not exceed $5,000.

The acting architect was Mr. George Cooke, of Orange, although to the talented wife of the owner, Mrs. F. W. Coolbaugh, is due the credit of arranging the general design and of planning the rooms. Indeed, to that lady is to be largely attributed the completeness and success of the whole structure.

Cooke & Berryman, of Orange, were the carpenters; Henry Dickson, Newark, N. J., mason; Orren Ford & Son, of E. Orange, decorators; and George Southward, of Montclair, N. J., the plumber, to whom much credit is due for the excellency and completeness of his work.

SPECIFICATION

of the work and materials requisite in the erection of a frame dwelling for F. W. Coolbaugh, Esq., to be located on the east side of Burnett Street, East Orange, N. J.

CARPENTER'S WORK.

Timber.—Sills, 4″×10″. Posts, ties, and plates, 4″×6″. First and second tiers of beams, 2″×10″. Third tier, 2″×9″. Rafters and long collar frames, 2″×6″. Collars in gables, 2″×4″. Valley rafters, 3″×7″. Floor beams, 16″ from centers. Third tier of beams to rest on 1¼″×5″ ribbons, let into stud, and to be well spiked to stud where possible. Piazza sills and ties 4″×8″ beams, 2″×8″, on 2″ centers. Door and window stud, 2½″×4″. All other studding, 2″×4″. All framing lumber to be of spruce. All studding of hemlock. Girders in cellar, 4″×8″. All framing to be done in best manner, mortised, trimmed, pinned, spiked, etc. Cut in large braces. Where necessary, trimmers, headers, and beams under partitions to be doubled. Piazza plate, 3″×8″. Rafters and collars, 2″×6″.

Bridging.—All beams having a span more than 10 ft. will have one row of herringbone bridging, 1¼×2, nailed with two nails at each end.

Furring.—Do all necessary furring.

Sheathing.—The entire frames and all roofs will be sheathed with tongued and grooved hemlock, well driven up and nailed with two eightpenny nails at each bearing. Cover all plumb parts with resin sized sheathing paper.

Outside Trimmings.—As shown on elevation. Water table in two parts. Belt courses will be formed by continuing the outer members of piazza cornice around the house. Second story will be continued around main house, and have 2″ mould under same, as shown. Sawed ends of rafters ceiled on top with 1″ ceiling plinth and 4″ crown mould, to be continued around all parts, as shown. Gables will be finished with hanging verges, brackets, rafters, etc. Brackets to be beaded on face, and have turned rosettes on sides. Gutters will be formed with 1″×5″ plinth, 1″×2″ mould, and 1″×2½″ cap. All gutters will be lined to form descent to outlets, and 1½″ sawed gutter ends, as shown. Cresting on main ridge of house will be formed with overlapping 1″ pine pieces, with 4″ roll on top, and have 6″ trimmings at ends, as shown. All other ridges will have 2″ roll for quirk. Galvanized iron vane in front gables. Dormers will be cased up, as shown, and have cornices to match main cornices.

Inclosure.—The plumb sides of house will be covered with 6″ beveled siding, with ¾″ lap, well nailed at each bearing, where shingles are shown, and they will be of even width, and cut to pattern, and smoothed on face.

Roof.—The main roof will be covered with 8″×16″ No. 1 ribbon slate portions, to have clipped corners. Do all necessary flashing around dormers and chimneys, etc Counterflash chimney. Slate laid in tar paper.

Tinning.—All gutters, valley, balcony floors, and veranda roofs will be lined with I. C. charcoal tin, well fitted and soldered. Put up 3″ tin leaders to all outlets to convey water to ground. Tin back of all chimneys.

Piazza.—Floor will be laid with 1×4½″ tongued and grooved pine. Ceiled overhead with ½×3 leaded ceiling. Floors to be nosed on edge, and have 1″ fascia and cove under same. Steps and strings will be 1¼″, sizes ⅞″. Plate will be boxed and be 6×8″. Cornices, as shown, with ⅞″ soffit, 1×5″ drop and cap, 3″ crown mould, 2″ bed mould. Form gutters at eaves same as main house. Columns 6″×6″ whitewood, turned newels, 5″×5″ turned caps. Spindles, as shown, 1″×1¼″, with 1½″×2″ bar under, and 2″ sawed brackets. Square turned balusters, 2½″×4″, beaded top rail, 2″×3″ bottom rail. Space between piers will be fitted with ⅜″×2″ lattice, with 1″×4″ frames to same. Build back stoop, as shown, with 1″×4½″ floor fascia posts, steps, and railings, etc.

Windows.—The frames will be made in the usual manner; 1¼×5 casings, 1¼ jambs, and blind stops, ½″ parting strips, 2″ main sill, 1″ top sill, 1¾ axle pulleys, pockets, etc., complete. All other sash will be 1½″ thick, glazed with French sheet glass, double thick for large lights. Sash on stairs and center of dining room bay will be glazed with leaded stain glass. All meeting rails 1½″ thick, with burglar proof bronzed sash fasts on same. Sash will be hung with Russian hemp cord and cast iron weights.

Blinds.—All windows above cellar less than 3 ft. wide, except stained glass windows, small dormer, and quarter circle windows in front gable, will have rolling slat binds, made, hung, and fastened in best manner, and painted two coats.

Doors.—Front doors made of pine as shown, 2″ thick, upper panels filled with cathedral glass. Vestibule doors to have leaded cathedral glass to cost $2 per foot. All to have suitable frames, jambs, etc. Sliding doors 2″ thick panels, not more than 10″ wide, all other doors four paneled, closet doors 1¼″ thick, all others not otherwise described, 1½″ thick.

Floors.—First and second floors will be laid with 1″ × 4½″ tongued and grooved pine flooring, free from loose knots and all bad defects, well driven up and blind nailed to each beam. Attic floor may be of wider pine.

Stairs.—Will be constructed as shown, of white pine lumber, 1¼″ steps and strings, ⅞″ risers, 6″ main newels, turned 4″ pedestals, turned caps 1½″, turned balusters 2½″ × 4″, moulded rail, newels, rail, and balusters of dark ash. Seat side of stairs, with lid to lift, hung with brass butts. Hat closet over seat, cased in and have door paneled. Closet under first platform. Back stairs to cellar, of pine, 1¼″ steps and risers. Main stairs to be furred and plastered underneath, steps to have nosings and cove.

Trimming.—Door and window casings throughout the house will be 4¾″ wide, moulded and beaded on face, and have neat turned corner blocks. Windows in hall, parlor, library and dining room will have moulded panel backs. All others will trim on neat mould nosings, with moulded aprons under same. Base on first story will be 7″ wide, beaded on face, and have 1½″ mould on top, mould to continue around trim. Base in second story 6″, other parts 5″. Neat moulded chair rail to continue around hall and dining room. Wash tub lids clamped, and hung with brass hinges and screws, turned legs under same. Kitchen sink to have pine apron and ash cap and drip grooved.

Bath Room.—Will be wainscoted with ½″ × 2½″ pine 3′ 6″ high with rabbeted cap. Face of tub and basin same. Basin to have door under. Brass butts and small cupboard catch.

Sundries.—Put down hardwood stoppers and saddles to all doors, also angle beads to all corners needing them. Build coal bin as shown.

Privy.—Privy 5′ × 5′, to be built of ceiling boards, joints battened. Shingled roof. To have floor, and seat, with two large and one small hole, with lids on same. Panel door, hung with butts, and have lock and key.

Hardware.—All doors to be hung with loose pin steeple tip butts, and furnished with mortise or rim locks, as the case may be. All 1½″ doors to have mortise locks. Front door lock to have night works complete, with bronze knobs and escutcheons. Porcelain knobs in first and second stories, with silver mountings. Kitchen and attic, japan trimmings. The sliding doors to have patent spring flush handles and locks bronze.

MASON WORK.

Cellar.—Excavate about 3 ft. earth, leave on premises, and level to a grade line against house. Excavate for cesspool, drain pipes, privy vault, etc.

Foundation.—Wall, up to grade line, to be laid up with good building stone and mortar. The balance of good hard burnt brick and good mortar. The stone wall will be 16″ thick, the brick 8″. Earth to be well rammed around foundation.

Piers.—To be as shown on drawings. Plaster on top of wall inside of sill with good cement, to keep cold air out. Put down cement bottom in cellar, of good cement and gravel, to the depth of 2½″.

Bluestone.—All window sills, copings, steps, cesspool cover, chimney caps and stone at bottom of stoops, hearth in kitchen, to be of suitable thickness bluestone.

Walls.—To be covered throughout with two coats scratch brown sand finish. Mortar to be made up at least five days before using. Plaster two rooms and hall in attic.

Cesspool.—Build cesspool 6′ × 8′, laid up with building stone.

Drain Pipe.—Lay five vitrified tile pipe, 17 ft. distance, to cesspool, to take waste water from closet sink.

Chimney.—Topped out with good hard burnt brick. Hackensack red mortar. Mason to build in all hot air pipes required furnished by the plumber.

Cement Bottom.—Cement cellar bottom with ⅓ Portland, ⅓ Rosendale cement, and ⅓ sand, 2½ inches thick. Cement under foundation before wall is laid, and extend cement, etc., inside of foundation.

PLUMBER'S WORK.

Soil Pipe.—From five feet outside of cellar wall furnish and lay a 5″ cast iron soil pipe, and connect in cellar with a 5″ cast iron running double hub trap, with 4″ double vents. From cesspool side of trap extend a 4″ galvanized iron pipe outside of house to the highest point of roof, and there cap with ventilation cap, for cesspool vent. From the end of the trap reduce the iron pipe to four inch cast iron pipe, and from that point run a 4″ cast iron pipe through the bath room to roof, leaving all necessary Y branches for fixtures in bath room, and cap with ventilating cap.

Soil Pipe Connection.—All joints to be packed with oakum and calked with hot lead. All lead connections to be made to iron pipes to be done with brass ferrules soldered on the end. Fresh air vent from trap to be carried up in cellar high enough so that a four by four T can be put in, and from said T carry a 4″ pipe to outside of cellar wall for fresh air vent. On top of said T calk in a 4″ trap screw for cleaning trap when necessary. Run all necessary lengths of 2″ cast iron pipe to receive the wastes from sink and wash trays, and connect to cast iron pipe in cellar.

Boiler.—Furnish and set up one forty gallon dome headed copper boiler, best make, set upon Lockwood's boiler stand, and connect the same with water back of range by ¾ AA lead pipe.

Wash Trays.—Supply three stone wash trays, with hot and cold water, through ⅝ AA lead pipe, and ⅝ flange and thimble wash tray bibs and 1½ inch wash tray plugs, and necessary length of 2″ lead waste pipe and 2 inch "Dubois" lead trap, connected to 2 inch iron pipe, with brass ferrule in cellar.

Sink.—Furnish and put up in kitchen one 30″ × 20″ crockery sink. Second, 6″ deep, with iron back, hot and cold water through ⅝ AA lead pipe and ⅝ compression flange and thimble bits. Waste through 2″ D lead pipe and 2″ "Dubois" trap.

Bath Tub.—Furnish and supply one 14 oz. copper, tinned and planished bath tub with hot and cold water through ⅝ AA lead pipe and nickel plated double compression bath bib, waste through 1½″ lead pipe and 1½″ "Dubois" lead trap.

Wash Basins.—Furnish and fit up two of the best Italian marble slabs, one 30″ × 22″ oval bowl, and one corner slab 1¼″ thick, countersunk and polished, with back 12″ high; supply the same with one 14″ patent overflow marble basin, with hot and cold water through ½″ AA lead pipe and nickel plated handle compression basin cocks, with nickel plated plug, chain, and chain stay. Waste through 1½″ lead pipe and 1½″ "Dubois" lead trap.

Hot Water Pipe.—Connect a ⅝ AA hot water pipe from boiler. Make all connections in said pipe for kitchen sink, wash trays, bath tub, and basin. Run a ¾ AA lead pipe from main supply pipe to bath room, to supply the same fixtures with cold water.

Ventilation.—Connect a 2″ vent pipe, from water closet traps, and connect it to 4″ soil pipe, 16″ above the bath room floor. Vent the traps under bath tub and basin by 1½″ lead pipe, with 3″ lead pipe from water closet vent.

Safes.—Line under bath tub, water closet, and basin with 3 lb. sheet lead turned up 3″ all around. Run a ¾″ E lead pipe from the safes down to the cellar ceiling, and there left open for safe waste. Place a 3″ brass strainer over every safe waste.

Water Closet.—Furnish and fit up one rapid stream washout water closet. Supply through a 1¼ C lead pipe. Supply to cistern through ½ AA lead pipe and ½″ stop cock. Connect to main soil pipe.

Stop Cocks.—Furnish and connect necessary stop cocks.

Circulation Pipes.—Connect at bottom of boiler a ½″ AA lead pipe, and run up to connect with hot water pipes in bath room for a circulation pipe. Place in one ⅝″ compression bib at bottom of boiler for sediment cock.

Heater.—Furnish and fit up in cellar one of Boynton Furnace Co.'s No. 114 brick-set furnaces, with heater pipes, registers, and dampers complete.

Heater Pipes.—One 10 inch pipe to hall; one 10 inch pipe to parlor; one 9 inch pipe to dining room; one 9 inch pipe to library, and pipes and heaters to other rooms as required.

Range.—Furnish and fit up in kitchen one No. 80 Newport, eight inch holes, with lower hot closets and canopy, ventilator, shelf register, water back, and couplings complete.

Tubs.—Furnish and fit up three tubs, one to be single and one double cement tubs. Large size with stands to cost $19.50.

Wash Bowls.—Two Italian marble wash bowls, 30 × 22, with oval bowls, complete, with hot and cold water, with double combination faucets. Connect the water to the furnace to feed water pan or bowl. Provide one of Southworth's "Celebrated" grease traps, with iron ladle attached.

The Luminous Bacillus.

Before the Physiological Society, Berlin, Dr. Hermes recently showed the luminous bacillus brought some time ago with marine fish from the West Indian Ocean, and bred in pure cultures. In nutrient gelatine the bacillus formed funnel-shaped cultures at the surface. Inoculated into sterilized fish, it rendered them luminous to a very high degree. The bacillus developed also in fresh water fish, but only when these were placed in salt water. In fresh water the bacillus disappeared. At temperatures below 25° Celsius, the luminosity ceased. It was easy with this fish bacillus to render a large quantity of sea water luminous. If, however, the water were allowed to stand for twenty-four hours, only the surface was luminous; but by stirring it up, the whole mass again became luminous in consequence of the interpenetration of the air.

THE aroma of red cedar is fatal to house moths; the aroma of black walnut leaves is fatal to fleas. It is a matter of common observation that persons engaged in the business of making shingles from odoriferous cypress timber in malarial districts are rarely, if ever, affected by malarial diseases, and that persons engaged in distilling turpentine do not suffer from malarial diseases or consumption. It is said that when cholera was epidemic in Memphis, Tenn., persons working in livery stables were entirely exempt from it. It is affirmed that since the destruction of clove trees on the island of Ternate, the colony has suffered from epidemics unknown before; and in times when cholera had prevailed in London and Paris, those employed in the perfumery factories have escaped its ravages.

Real Estate Title Insurance.

Real Estate Title Insurance is an important factor which has been recently introduced into real estate transactions, assuring property owners of the validity of their titles beyond question or dispute; and is a substitute for the present expensive and tedious system of examination of titles, affording to the parties insured complete security against loss.

This relief and protection to purchasers or mortgagees of real property is to be found in an absolute insurance of title, by a sound and permanent corporation, with a large cash capital, standing ready to make good any insured title found defective from whatever cause.

The German-American Real Estate Title Guarantee Company, No. 34 Nassau St., New York, has been organized pursuant to Chap. 538 of the New York State laws of 1885, with a capital of $500,000, placed by statute under the supervision of the Superintendent of the Insurance Department of the State of New York, and will, upon the proper application, examine titles to real estate, and issue a policy of insurance which shall afford absolute protection to the purchaser, his heirs and devisees, and to the lender upon bond and mortgage, against all loss from defective title.

The company for its own protection will examine the titles it insures in a most thorough manner, by experts in its employ and by means of records and a plan of its own, and will then *guarantee its work.*

It will defend all actions brought against holders of its policies by reason of defects in the title insured, at its own expense, and will pay all losses to the extent of the policy issued.

If after an examination of the title the company refuse to issue a policy upon it, no fee is charged for the examination.

The usual fee of the company for the examination and guarantee in New York is $50 and disbursements, with an additional $5 on each $1,000 in excess of $5,000. In Brooklyn it is $30 and disbursements, with an additional $5 on each $1,000 in excess of $3,000.

Special rates for building operations, auction sales, and titles involving $50,000 or more.

The payment of a small fee permits a transfer of the guarantee with the deeds, in case of sale of mortgage.

Reissues to subsequent purchasers or mortgagees within five years, at one-third original fee.

If the title, when examined, is rejected by the company, no charge is made except for actual disbursements.

The law directs that the company, before it issues a policy, shall set apart a sum not less than two-thirds of the amount of its capital stock as a guarantee fund, to be invested as the statute provides, and to be applied only for the security and payment of losses incurred by reason of guarantees issued. A solid foundation for business is thus insured.

This system accomplishes the following:

1. *Security.*—It is the only system that affords absolute protection against defective titles.

2. *Saving of Time.*—The company proposes, by means of its superior facilities and the employment of a number of skilled lawyers, engaged exclusively in the searching of titles, to pass upon them with promptness. A property, the title to which has once been guaranteed, can be transferred within a very short time after application is made; and institutions, estates, and individuals holding mortgages upon such property can convert them into cash at once, instead of consuming from twenty to thirty days, as is now required, in having the titles researched upon each transfer.

3. *Saving of Money.*—It is proposed to guarantee the title, in the first instance, for a less sum than must now be paid to have the same title searched by a competent attorney; thus additional security is obtained, as well as time saved, at less cost.

After the title has once been searched and guaranteed, the property may be transferred, or a mortgage upon it assigned, and a similar guarantee obtained by the purchaser for one-third of the sum paid for the first guarantee.

4. *Ease of Transfer.*—A guaranty policy will enable an owner of a piece of property to convert it into money within a day or two, or obtain in the same time a loan upon it, on bond and mortgage; and will thus make real estate as available for collateral as stocks and bonds. This will serve to increase the demand for real property. Thus, briefly outlined, the new system offers absolute security from loss, saving in expense of conveyancing, charges fixed and known before the work is begun, special safeguards for mortgagees, and expedition in the transaction of business

The officers of the company are:

President, Andrew L. Soulard; *Vice-President*, Charles Hauselt; *Secretary*, Adolph Koppel; *Treasurer*, William Wagner; *Counsel*, Charles Unangst.

The directors are:

Charles Hauselt, John A. Beyer, A. J. D. Wedemeyer, George W. Quintard, Charles F. Tag, George C. Clausen, William Wagner, James Fellows, John Straiton, Jacob F. Miller, Adolph Koppel, Charles Unangst, Andrew L. Soulard.

The Summit Color Works.

It is evident that an architecturally beautiful house may be rendered unsightly by the use of inharmonious and gaudy paints, and it is equally evident that the most commonplace structure may be made attractive by the judicious selection and application of appropriate colors. Fortunately, the individual who is devoid of taste in this direction is generally aware of the fact, and therefore relies, for the ornamentation of his house at least, upon some one more artistically inclined. But instances are only too common of buildings covered with colors that seem to be at war with each other, and the casual observer feels a deep seated disgust for the owner and a sincere pity for the neighbors who are compelled to live in close proximity to the eyesore, especially when he remembers that the case might easily have been reversed had the owner possessed common sense enough to have placed the ornamentation of his dwelling in other hands.

This difficulty of selecting colors that will blend well, so as to produce the most pleasing effects, has been recognized by the well known firm of Chas. M. Childs & Co., of 225 Pearl street, this city, who have adopted an admirable method for presenting their pure ready mixed paints to builders and property owners who may not have the facilities for selection found in the large cities. Upon their specimen card they display the best and latest styles of colors, arranged in combinations of three each; and each combination shows the body, trimming, and blinds. The card before us contains twenty-seven colors, forming nine combinations, the upper color of each of which is the body, just beneath which is the trimming, with the blinds at the bottom. It is not an easy task, even for one having some experience, to select from the colors now so much in demand those which will appear well when spread over large surfaces, as the use of a wrong shade may destroy the intended general effect of the whole work. But by means of this card the various colors can be studied to the best advantage, and an accurate estimate formed regarding the effect to be produced when applied to any building. As the combinations were arranged by one of the best decorators in the country, the colors may be relied upon to blend well and be in harmony with each other, and to produce tasteful and pleasing effects. Although the user is, of course, free to make such other combinations as he may think best, he may rest assured that if he employs either of those presented, he will obtain attractive results.

It is apparent that this method of presenting colors will not only be appreciated by those who may be said to be "color blind" regarding the harmonious blending of shades, but will also be welcomed by the professional builder and architect, to whom it will prove to be of much assistance.

Scattered here and there throughout the country are a few who, through ignorance or design, cheapen or water their materials. The paint they use looks well enough when fresh, or until the job is complete; but it soon begins to present a weather beaten and dilapidated appearance. There are also owners—landlords—who have the notion that a cheap and inferior paint will last "long enough," and that it is more economical to cover frequently with poor material than it is to pay a little more at first, and get the best. Both of these classes ignore the fact that good paint to start with is, in the end, the cheapest. It would be to the decided advantage of some house owners to try the experiment of using a superior quality of paint, and ascertain for themselves if the difference in the first cost is not more than compensated for by the durability of the paint and the better general appearance of the house.

These paints are made only of material carefully selected, and of the purest quality. The greatest care and skill are exercised in their preparation, and they are guaranteed to be equal in all respects to any manufactured. They are presented in packages of various sizes, from a barrel of fifty gallons down to as small a quantity as one quart, and are also put up in cans containing from one to ten pounds.

The Messrs. Childs & Co. also prepare white paint for inside and outside work, and will at all times make any shade desired, when ordered in quantities of five gallons or over. This is an important consideration, and one that will be well received by builders, since it practically places at their disposal all the skill, experience, material, and machinery of an extensive paint works, and enables them to experiment with new colors at a moderate expense, and to order new shades of their own selection, with the certainty that their instructions will be faithfully followed.

It would be well for those contemplating building or painting this spring to send for one of these cards, even if for no other purpose than to have specimens of the shades that will be widely used. Further information concerning these paints, prices, etc., may be obtained by addressing Messrs. Childs & Co., as above.

The total production of pig iron in the United States in 1886 was 6,366,688 net tons. This includes 47,982 net tons of spiegeleisen. The unsold stock of pig iron on hand on the last of December was 249,504 net tons.

Floors and Ceilings: Ancient and Modern.

BY C. POWELL KARR, C.E, CONSULTING ARCHITECT, NEW YORK.

I.

In this series of articles the writer will endeavor to present a graphic account of the floors, floor coverings, and ceilings of the world. It would be interesting and profitable to visit the homes of the cave dwellers of India, the lake dwellers of Europe and the mound builders of America, but we should be obliged to invade the domain of regions still unexplored, and about which our knowledge is still in a formative state. We shall feel it a necessity, in some instances, to visit the huts of primitive man in many countries, but we shall not pause to discuss the archæology of remains of civilizations, but shall try to confine ourselves to races of men that are now living, or of whom we have positive information. We shall begin our journey in the land of the rising sun, and shall make the tour of the world, following the sun in its path to its setting in the golden gate of "the new world, which is the old." We shall visit Japan, Corea, China, Farther India, India, Siberia, Africa, the countries of Europe and America. In our wanderings, we shall try to enter the hut of the savage, the home of the working class, the buildings of state, and the palaces of potentates. Some of the buildings that we are privileged to enter we shall describe and illustrate, from both an æsthetic and technical point of view, and where it is possible, we shall give a technical description of floor construction, and the manufacture of fabrics that cover the floors. We shall try to point out the art and science of such construction, whenever it is possible to obtain such information. Our data have been collated from authentic sources, chiefly from travelers who have been eyewitnesses and observers of what we shall attempt to describe. We shall begin with "Mother Earth," the floor of primitive man in all ages, and conclude with the earthen floors which have been metamorphosed by heat and the arts of man, and to which we have given the generic title of tiling. Where man in his primitive state has found it necessary to provide his habitation with some kind of a floor, his instinct for want of definite knowledge has prompted him to make use of clay, as the best mineral substance adapted to his purpose, and the researches of the most learned modern scientists have so far been unable to discover any better material, although the treatment of it has been widely different. The primitive man has added sufficient water to the clay to make a stiff paste and spread it over the surface, kneading it with his feet, or ramming it with sticks or stones until it has become compact. The wind and sun complete his work by making the floor as hard as stone. The man of the nineteenth century has simply selected his material from the resources of the earth's crust, ground them to a fine powder, studied the properties of their elements, learned their chemical affinities and relations, studied the precise conditions his work must fulfill; his art has triumphed over nature, and he has been able to produce the marvelous mosaics and encaustic and endolithic art tiles which meet us in every building of note of modern times. From the first floor to the last floor, are many gaps in the records of locality and time, but we shall endeavor to trace the connection between the two, and in the endeavor we shall go from empire to kingdom, from principality to state, and from earliest historic time up to the present day.

We shall begin our journey with a brief description of the country itself. The name Japan, pronounced in the native language Nipon, is of Chinese origin, in the Mandarin dialect Jih-pun, that is sun source or eastern country. The celebrated Venetian, Marco Polo, was the first European to write an account of the country and its people. His work was written in 1298, in the Latin language. The Japanese chronicles go back of this date many centuries. The empire lies in the northwestern part of the Pacific Ocean, and consists of four large islands and a great number of small ones. It is separated on the west from Corea by a strait, which is about one hundred miles wide. At its northwestern extremity is the island of Tisima, or the "Thousand Islands," and at the north is the island of Krafto, or Saghalien, formerly a part of the empire, but now owned by Russia. The largest of the islands which make up the empire is Nipon, and it contains about 95,000 square miles; the next in size is Yesso, having an area of 30,000 square miles; then Kinsin, 16,000 square miles; and last, Sikok, with 10,000 square miles. The total length of the empire is 1,600 miles, and its greatest breadth is 200 miles. In all it numbers 3,850 islands. Its total area is 148,456 square miles. It is slightly larger than Montana, and only 644 square miles smaller than Dakota.

THE ART OF JAPAN.

From the wonderful works in ivory, lacquer, metal, embroidery, enamel pottery, and color work which have come to us from time to time, from the glowing accounts of travelers who have spent many years of study and research in that remarkable group of islands, we may well concede to Japan, of all oriental countries, the most pre-eminent position in all matters connected with the decorative and ornamental arts. In a number of branches of art manufacture, it is without a peer in the civilized world. Mr. Audsley well says that the peculiar habits and simple modes of life of the Japanese have not favored the general production of what may be considered important works of art.

Their tastes and industry have expended themselves in the formation, in an artistic form or with elaborate ornamentation, of countless articles of utility, articles of every day use, suitable for all classes of people. Beyond a few small cabinets, tiers of shelves, low stands, trays, and similar objects, they have no household furniture. Mats cover the floors, and on these they sit during the day and sleep at night. Japanese houses are divided into apartments at will by sliding screens, formed of wood frames, covered with paper, patterned or painted with landscapes, flowers, and birds.

Folding screens, either painted or embroidered, are also used Special works of art in the shape of pictures, *kakemono*, or hanging pictures, are hung up on certain occasions, and help to relieve the extreme simplicity of the apartments. The most talented Japanese artists have produced many of their best drawings in the shape of kakemono.

According to Mr. Audsley and other writers of note, it is a fact worthy of notice that many of the most talented artists which Japan has produced have been satisfied to labor in the humble fields of art industry; and painters and designers of repute have not thought it beneath their dignity to display their manipulative skill and the wealth of their imagination in the adornments of common objects of daily use.

Honest workmanship is a leading characteristic in all branches of Japanese ornamental art. There is a greatness about such loving honesty which cannot be overestimated, and its influence is stamped upon every genuine art work which has been produced in Japan.

According to Louis Gonse, the architectural art of Japan has two dominant qualities; first, its intimate association with the character of the landscape which makes its *mise en scene*, and its decoration. This, though, in two senses, is more in the structure itself than in the brilliancy of the Japanese genius. That minuteness of finish which we admire in such a small type as a lacquered box, or in what may be an unimportant and common object, will be found equally carried out in the ornamentation of a temple. In it all, and through it all, we see the same good faith in execution, the same fidelity to the main conception. No matter how minute the details, the same regard is exhibited and the work is executed with like scrupulosity. In his luxurious work Mr. Gonse has likened them to the master workmen of the thirteenth century, who judged of the beauty of their work by its complication, and declares that it is nothing if not indigenous to their solicitude. The Japanese have a marvelous understanding of how to express exquisite elegance with moderation. His summary of the household appointments does not differ in any particulars from what we have related. He remarks that it is only when the proprietor of the house is a man of taste that the kakemono carries the signature of the master, and the screen becomes a veritable work of art.

(*To be continued.*)

Incendiary Birds.

To the Editor of the Scientific American:

I write to relate an incident which may be of interest to some of the readers of your valuable paper. There is a bar iron mill situated in a neighboring town four miles from here, that has been on fire three or four times, in which the English sparrow might be called the incendiary. These sparrows pick up old pieces of cotton waste, which they build in their nests, among the timbers of the roof of the mill, and in every case of the fires above mentioned, these nests were the cause, either from spontaneous combustion or from sparks from the hot iron striking and lodging in the nest. If you could suggest some way of getting rid of the sparrows, I think the manager of the mill would be glad to adopt your plan. R. W. Kear.

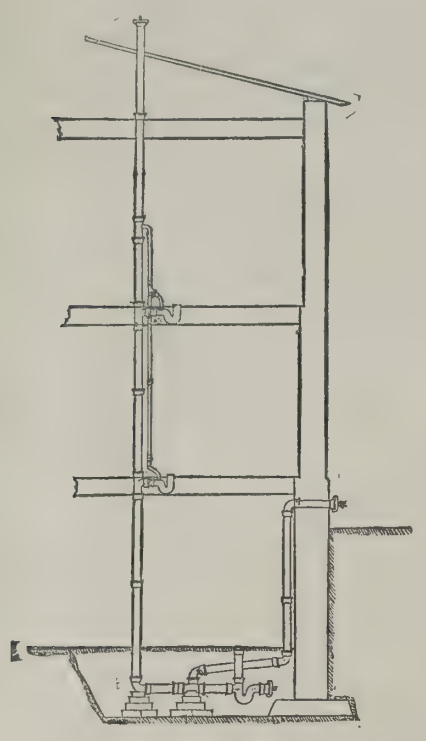
Pottsville, Pa., February 14, 1887.

AN ENTRANCE PORCH.

Our illustration, from *The Builder*, is a sketch of the entrance porch of Dutton Hall, one of the famous old English homes. The curious and ornamental construction here so well blended affords a good subject for study.

TESTS OF PLUMBING IN MINNEAPOLIS.

This cut represents a section of a two story and basement house, with the plumbing ready for inspection.



The stack is complete from top to, and including, the running trap and fresh air inlet. The traps for water closets and wastes for wash bowls, bath, and kitchen sink, are all calked in, the traps wiped on to wastes, pinched together at the top, and soldered up. A piece of heavy sheet lead is soldered on top of the water closet traps; the ventilation pipes are connected with the crowns of traps; the soil pipe is sealed at top and bottom, and the fresh air inlet is left to attach the proving apparatus. We have the whole system of plumbing under test; whereas, if only the soil pipe were tested, there are yet three joints to make for every fixture, which will never be under proper test. While it is not practicable in all cases to connect the traps as soon as the soil pipe is roughed in, owing to the unfinished state of the carpenter work, yet, as a rule, water closet traps, lead bends, and a short piece of waste pipe can generally be calked in when the roughing-in is done. Then if it stands the test, there is little danger from open joints in the balance of the work. However, when it is possible, the whole system of plumbing should be under test at the same time. Ten pounds of compressed air to the square inch, on a complete job, is a fair test. If the work stands under that pressure, it will, as a rule, stand fifteen pounds or more. Good workmen have no trouble in making their work absolutely air tight, with extra heavy soil pipe. The greatest danger is in calking around brass ferrules, and great care should be taken lest they "buckle in."

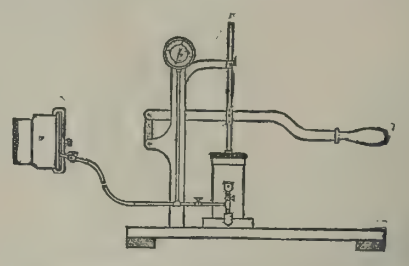
The other cut represents a testing apparatus recently devised (not patented) by Plumbing Inspector Hazen, and as any mechanic can construct one, we take pleasure in presenting it to our readers. It has been in use in this city about two months, and gives entire satisfaction to plumbers, architects, and owners. Its ability to make a thorough test, together with its simplicity, commends it at once.

To test a job of plumbing with the proving apparatus, it is necessary to have a two or four inch iron plug with rubber gasket to fit on the shoulder of the pipe in the hub F, held in place by a clamp over the end of the hub, with a set screw in the center to screw down on the plug. Into one side of this plug, screw in a short nipple and cock, G, to attach a hose from the pump; close cock, D, and open cock, E; work the pump until the gauge, C, shows five pounds pressure, then close cock, E. If the work is absolutely tight, the indicator will remain at five pounds; if defective, the indicator will go down. Now unscrew cap of ether cup, B; open cock, D, and let the pressure off from the pipe; close cock, D; put one ounce of ether in the cup; screw on cap; open cock, D, to let the ether down, and at the same time begin to work the pump; close cock, D; pump up to five pounds pressure, and close cock, E. The ether will indicate where the leaks are, which the plumber will at once calk tight. Test the work again at ten pounds pressure, and if the indicator stands at that, the work is absolutely tight.

To test the pump, put on ten pounds pressure, close cocks, G and E, and if the indicator stands, the pump is tight.

A little soap and water put on the leaky joints with a brush will show the exact location of a leak, by the formation of bubbles.

For good sanitary plumbing, a strict observance of



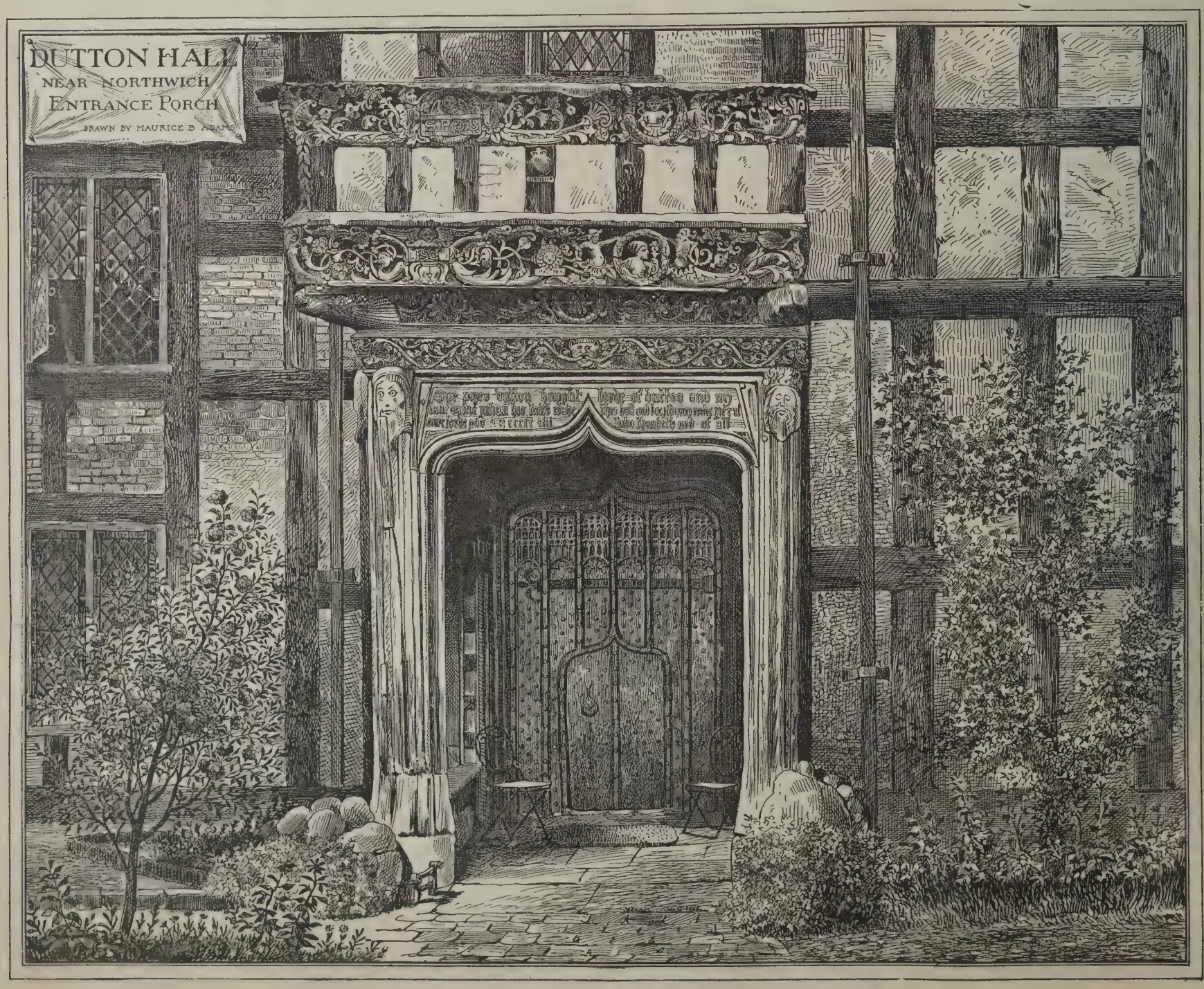
INSPECTOR HAZEN'S PUMP.

the city ordinances by the plumbers, and thorough examination and inspection, Minneapolis is second to no other city in the Union.—*N. W. Architect.*

A Telegraph Lantern.

The Oatman signal telegraph lantern is intended for military and naval use. This lantern is of a convenient size, strong and simple in construction, and can easily be carried around. A blowpipe flame is used, which so intensifies the light that it resembles an electric light, and can be easily seen with the naked eye for 10½ miles, and with a glass for 15 miles. The messages are exchanged by the Continental code or Morse system, the dot being signified by a quick flash and the dash by a flash of longer duration. Ordinary mineral oil is used, and the light will burn for about five hours with the one filling. Rain or wind has no effect on it.

In a letter of indorsement from the Chief Signal Officer, War Department, to whom lanterns were given for trial, it is stated that messages were exchanged between Sugar Loaf and Camp Biddle, a distance of 20 miles. A board of officers appointed by the Navy Department to examine the lantern also attest its value.



AN ENTRANCE PORCH.

MINERAL WOOL AS A FILLING.

The necessity for using non-conducting substances as filling material between floors, partitions, side walls, and roofs is now very generally recognized and practiced by architects and builders. Of the various substances proposed for this purpose, probably the best, regarded in all aspects, is the article now widely known in the trade as *mineral wool*. This substance is, in fact, nothing more nor less than a species of glass, drawn out by a peculiar process into the form of fine threads, which are curled up into innumerable convolutions, and hence the name *mineral wool*.

It will at once be apparent from the enduring nature of its composition that it is admirably adapted for the purpose mentioned. It is now very extensively employed, and its use is becoming quite general. We give herewith an engraving of an ordinary dwelling house, with parts broken out to illustrate how the *mineral wool* is applied and used, between the floors, in the roofing, the side walls and the partitions. Now the objects of these fillings may be stated as follows :

As to Heat and Cold.—A filling of *mineral wool* in the ground floor, say two inches thick, protects against the dampness of cellar. In the outside walls, from foundation to peak, between the studding, it will prevent the extraction of the warmth of interior, and will destroy the force of winds which otherwise will penetrate and cause draughts. In the roof, say two inches thick, it will retain the heat which rises through stair wells, bringing about regularity of temperature in cold weather. The upper rooms will not receive the heat of the summer sun and store it up for the occupants during the night, but remain as cool as those on the floor below. The water fixtures in bath rooms, closets, and pantries will not be exposed to extremes of heat and cold.

As to Sound.—As sound is communicated by the actual contact of beams, and also by the vibration of the air between them, it can well be understood how a porous material like *mineral wool* will have a muffling influence on the solid parts of a building, and so occupy the space that wave motions will not be possible. Such a lining is especially desirable about bath rooms to deaden noise of valves and flowing water.

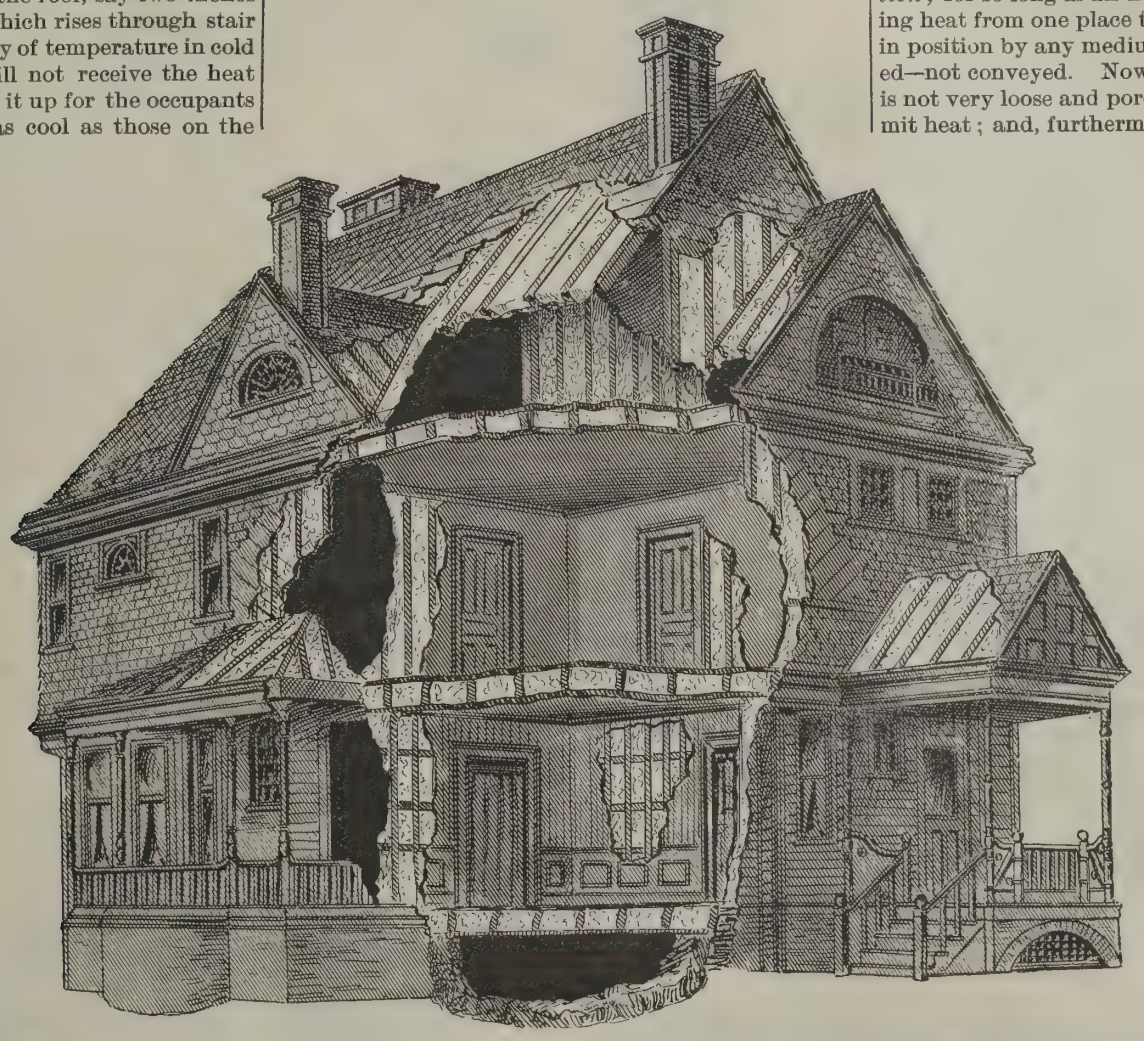
As to Rats, Mice, Insects, and Disease Germs.—The analysis of *mineral wool* shows it to be a silicate of magnesia, lime, alumina, potash, and soda. The slag wool contains also some sulphur compounds. It is plain there is nothing organic in the stuff to decay or to furnish food and comfort to insects and vermin. On the other hand, the fine fibers of glass are irritating to anything which attempts to burrow in them. We feel confident in saying that new houses lined with *mineral wool* will not become infested with animal life, and old walls may be ridden of their tenants by the introduction of it.

All earths, mortars, felts, and sheathing papers contain organic matter, such as hair and vegetable fiber, which, after a time, undergo decomposition and create a variety of disease germs. The dangers to health arising from the presence of these sources of infection are greatly aggravated by the continued filtering of dust particles and water through cracks. To leave the floor spaces empty would not avoid contamination in this way, except such parts are open to thorough ventilation, otherwise they would simply form a refuge for a mixed population.

As to Fire.—An incombustible material like *mineral wool* renders a building slow burning. We do not claim that it will be *fire-proof*, for that is impossible so long as inflammable stuff is used in construction. In passages occupied by the *mineral wool* flames cannot spread. Thus surely will they be exposed to sight, and an opportunity for quenching them be offered at the outset. It hinders the spread of fire, and thus gives time for *escape for the inmates, thus serving better than ladders.*

Spontaneous combustion sometimes takes place when the floor beams, for instance, have been dried until the point of ignition is very low, and when in conjunction with this the freely circulating air is charged with moisture. With these two conditions fulfilled, it only needs the fanning action of a draught to start combustion. Such a coincidence of conditions cannot be brought about if the spaces between beams are filled with indestructible mineral wool.

In all its uses *mineral wool* must be held in position by retaining walls, which should be sealed tight to keep the finer particles from sifting out. The house should be closed in, so that the material may not become wet, and the wall filled from the inside. The job should be done at the same time that the laths are being put on. Apply by the handful, and only press into place so that it fills the spaces completely. Do not jam or push roughly with sticks. Being applied *dry*, the other work is not delayed at all, and there is no possibility of dampness. Once in place, it remains intact until the retaining walls are removed. The presence of *mineral wool* behind the lath does not prevent the plaster *keying*. It is pliable, and gives way readily to the pressure.



FLOORS, ROOFS, PARTITIONS, AND SIDE WALLS FILLED WITH MINERAL WOOL

If the owner of a house is thinking of insulating it by *back plastering*, or deadening it with *mortar*, or making it free from vermin by a filling of *shavings*, or rendering it incombustible by sheathing the air spaces with *tarred paper*, he is fortunate in having but one object to gain, and but one way of accomplishing it. It is obvious that to ask the cost of this vitreous substance as compared with that of the usual devices is not pertinent, because it substitutes them all, while none of the others serves more than *one specific purpose*.

A car load of ordinary slag wool containing 1,400 cubic feet will answer to fill 4,200 square feet 4 inches thick or 8,400 square feet 2 inches thick. The approximate cost will be $200. The value of such a quantity must be in its affording comfort, besides securing economy in heating and insurance.

Mineral wool is invaluable in hospitals and asylums on account of its arresting the spread of fire, not to mention its other properties. Equally important applications can be made with it in public and private schools, music and concert rooms, sounding boards, hotels, cottages, country residences, charitable institutions, and in deadening the flats of apartment houses, and insulating the outside walls of conservatories, hen and pigeon houses.

Mineral wool is made by converting vitreous or scoriaceous substances into a fibrous state. The slag of blast furnaces affords a large supply of material suitable for this purpose. The product thus obtained is known as *slag wool*. For the reason that slags are seldom free from compounds of sulphur, which are objectionable in the fiber, and in order to be independent of the action of furnaces, we prepare a cinder from which we make *rock wool*. These two products comprise the two kinds of *mineral wool*. They are not to be distinguished from it, but from each other.

The grades of *mineral wool*, *extra* and *ordinary*, are based upon difference in weight and quality. There is no distinction in composition. The ordinary grade contains the coarser fibers intermingled with a few shot, which it is not possible to shake out entirely.

Air is so subtile and rapid in movement when unconfined, and so slow to convey heat, except by its own motion, that it is at once the very best distributor of heat and also the greatest barrier to its transmission, according as it has or has not freedom to circulate. It is not a matter of surprise that this apparently anomalous state of things is misleading and constantly giving rise to popular errors. That the dimensions of what is called an air space are entirely arbitrary, no one will deny. It may have a volume of one cubic foot, or it may be the smallest unit of volume into which air is divisible. We are disposed to classify the first case under *climatology*, and the second under *insulation;* for so long as air may circulate at all, it is conveying heat from one place to another, while if it is held in position by any medium, the heat must be conducted—not conveyed. Now, if the air-confining material is not very loose and porous, it will be found to transmit heat; and, furthermore, the reduction of the percentage of volume of air, by making the material more compact, develops its capacity for conducting heat. Therefore, so far as theory goes, the poorest conductor of heat is the material which contains the largest percentage of volume of air. Any other view of it is at variance with science and the many illustrations found in nature.

We find that 192 pounds, or *one cubic foot*, of slag make 192 pounds, or *ten cubic feet*, of ordinary mineral wool, so that the resulting fibers incase nine cubic feet of air. In other words, the cubic foot, before conversion, contained 100 per cent. of material, and after conversion only 10 per cent.; therefore the product must contain 90 per cent. of its volume of air. In same way the *extra* grade is found to have 95 per cent. of its volume of air in it, and, consequently, it is a poorer conductor than the *ordinary*. It is certain that this proportion of air is not incased by any other product, natural or artificial, which is, at the same time, indestructible.

The transmission of sound is prevented by a filling of *mineral wool*, because of its slight elasticity and want of solidity. This is a very important feature, because no other material in general use for heat-proofing and fire-proofing possesses also the property of sound-proofing. A fourth advantage, which is of equal value with the others, is the irritation which the glass fibers cause both to insects and vermin. There is nothing in its composition which can help to breed or harbor insects, and no animal life will remain in it.

Further information can be obtained respecting the advantages and uses of this excellent material by addressing the United States Mineral Wool Co., 22 Cortlandt Street, New York.

Mexican Windows.

Mexicans seem to entertain the idea that windows were made to look in at as well as to look out of, and it is a matter of daily occurrence for men, women, and children of the *gamin* order, including peddlers and professional beggars, to congregate outside the bars and stand calmly staring in at us by the hour. The first sight of these barred windows strikes the stranger in Mexico rather unpleasantly, and he is apt to fancy himself in prison behind them, with his iron bedstead and brick floor for suitable accessories. In time, however, he realizes not only the conveniences but the necessity of them, and by and by feels an uneasy sense of insecurity if by some rare chance he finds himself not thus protected. The greater portion of Mexico is a land of perpetual summer, where windows must be open both night and day, and these gratings cannot be "picked" like locks, or noiselessly cut like panes of glass. But though one may sleep here in perfect security without closing a shutter, it is well to move one's effects from proximity to the windows, for the *ladrones* have a habit of throwing in ropes with hooks attached and dexterously drawing out even your garments—from which practice, perhaps, originated the Texan slang word "hooking," for stealing. It is only justice to add that there is far less thieving going on in Mexico, in proportion to population, than in our own country, for the influence of Roman Catholicism is paramount, especially among the poorer classes. I venture to assert that with all your spring bolts and careful precautions to bring in even the door mats at nightfall, there is more stealing done in any Northern city in a single day than in all Mexico in a year's time. —*Phil. Record.*

THE LEWIS GRATE AND OPEN FIREPLACE.

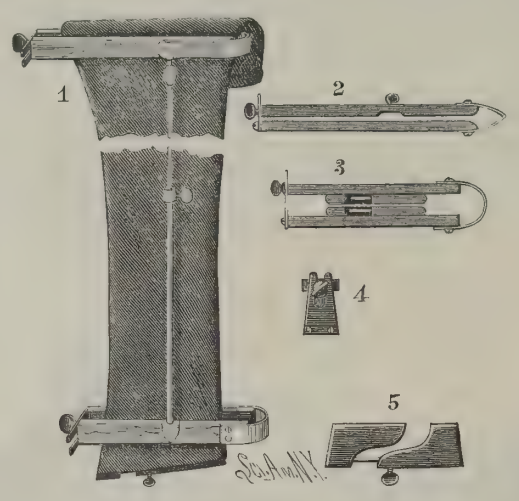
The advantages possessed by the grate herewith illustrated, when compared with the old style, are so strikingly evident as to need but a brief description. The heat and products of combustion pass from the fire in the basket, A, under the hood, B, down the flues or columns, CC, into the hollow base, D, and thence back under the grate to the main flue or chimney. The course is clearly indicated by the arrows in the sectional view. The back fire wall, I, is composed of four pieces, the upper one being of corrugated iron so arranged as to receive the lower half of back and two side pieces, which are of fire tiling 2¾ inches thick, thus making a smooth, firm, and durable back. If thought desirable, the back wall can be built altogether of fire tiling. The door, E, in the front of the hollow base is for the purpose of removing all accumulations of soot and ashes that fall down the chimney. It is also provided with a register to check the draught after the fire has burned to a bed of coals, thereby retaining the heat. The chimney walls are represented at HH. As the heat is retained in the fire chamber by the hood, B, a more perfect combustion is created, and the heat is thrown out into the apartment instead of passing up the chimney, as in the grates now in use.

The following claims are presented for this grate over others: A more perfect draught; to give double the heat with the same amount of fuel; to heat a room in one-third of the time; no soot can possibly fall down the chimney to injure rugs, carpets, etc; while poking the fire, no ashes will fly over the room, covering everything on the mantel and surroundings; no possible danger of flues catching fire, and endangering life and property; no need of stopping up flue or taking out basket during the warm season; it is ever ready to build a fire on cold, damp days in spring and fall. By having a water tank of from three to five gallons capacity placed on top of the hood, it is possible to have hot water in the room at all times during the winter season.

All further particulars concerning this grate, which is spoken of in the highest terms by those who have used it, can be obtained by addressing The Lewis Grate Co., of 316 West Sixth Street, Cincinnati, Ohio.

TROUSERS STRETCHER.

It is claimed for the trousers stretcher here illustrated that it is adjustable to any size of trousers; that



WESTON'S TROUSERS STRETCHER.

it will not form creases in them; and, by the use of adjustable forms inserted in their bottoms, it not only does not give an objectionable shape to them, but directly tends to restore their original shape. It is thoroughly effective in stretching the trousers as well. The upper part of the trousers is grasped by the clamp shown in Fig. 2, while the lower parts are held by the one shown in Fig. 3. Each clamp consists of two bars, united at one end by a bent spring, and provided at the other end with a slotted strap and screw (Fig. 4), by means of which the bars are held against the trousers. Within the bottom of each leg is placed a tree, Fig. 5, the bars of which can be adjusted by means of a rod and set screw so as to properly occupy the bottom portions of the pantaloons. The ends of the trees are inclined, as shown, so as to conform to the shape of the bottoms of the trousers. The use of trees is, of course, unnecessary with the upper clamp. The position of the clamps, when in use, is clearly indicated by the perspective view, Fig. 1. The forcing of the clamps away from each other, and the consequent stretching of the trousers, are effected by a simple telescopic connection, which also adapts the stretcher to trousers of different lengths. When the straps are released, the springs cause the bars to spring apart and thereby disengage the clamps from the trousers.

This invention has been patented by Mr. E. C. Weston, of 17 South Fortieth Street, Philadelphia, Pa., who will furnish particulars concerning the sale of the patent or manufacture on royalty.

Easy Water Tests.

1. *For Detecting Organic Matter in Water.*—To half a wineglassful of the water add about a dozen drops of a solution of *permanganate of potash* (Condy's fluid). This will give a *rose color* to the water. Let it stand for two hours. If the color changes to *dull yellow*, the water is unwholesome. If the color disappears, the water is positively dangerous.

2. *For Detecting Lead in Drinking Water.*—To half a wineglassful of the water add a dozen drops of a solution of *bicarbonate of potash.* If the water becomes dull or clouded, there is lead in it, and it is, therefore, injurious to health.

3. *For Detecting Carbonate of Lime in Water.*—To half a wineglassful of the water add twenty or thirty drops of a solution of *caustic lime.* Presently, the water will have a milky appearance if it contains carbonate of lime Let it then stand for two or three hours, and there will be a white sediment.

4. *For Detecting Sulphate of Lime in Water.*—To half a wineglassful of the water add twenty to twenty-five drops of a solution of *nitrate of baryta.* A *milky* appearance afterward and a white precipitate will indicate the presence of sulphate of lime.

5. *For Detecting Ammonia in Water.*—To half a wineglassful of the water add twelve drops of a solution of *zinc.* There will be a *cloudy* or milky appearance if *ammonia* is present.

6. *For Detecting Iron in Water.*—To half a wineglassful of the water add a few drops of a solution of *prussiate of potash.* A *blue* color will be produced if *iron* is present.

7. *For Detecting Phosphates in Water.*—To half a wineglassful of the water add five or six drops of *ammonia.* A *white*, *cloudy* appearance will result if phosphates are present.

8. *For Detecting Sewage in Well Water.*—Pour some of the water to be examined into a very weak solution of *permanganate of potash* (Condy's fluid). It will be turned *green* or be bleached if *sewage* is present.

9. *A Negative Test for Determining whether Water can hold Lead in Solution.*—To half a wineglassful of the water add a few drops of a solution of *acetate of lead.* If a *cloudy or milky* appearance results, the water *cannot* hold *lead* in solution.—*Industrial Review.*

Hon. S. Hallett, F.R.G.S., referring to the great changes in every department of trade, commerce, manufactures, etc., in a lecture before the Society of Arts, London, said that in Great Britain fifty years ago, two-thirds of the working classes were engaged in agriculture, while now only one-fourth are thus employed.

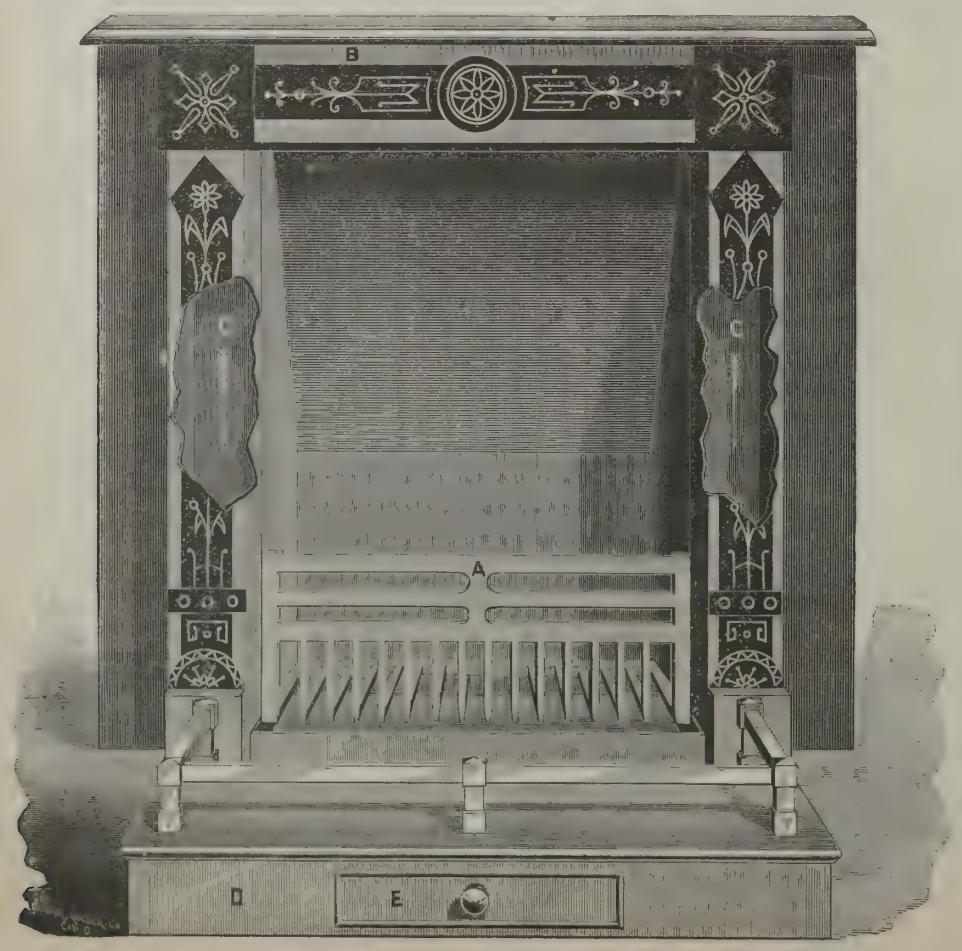


Fig. 1.—FRONT VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

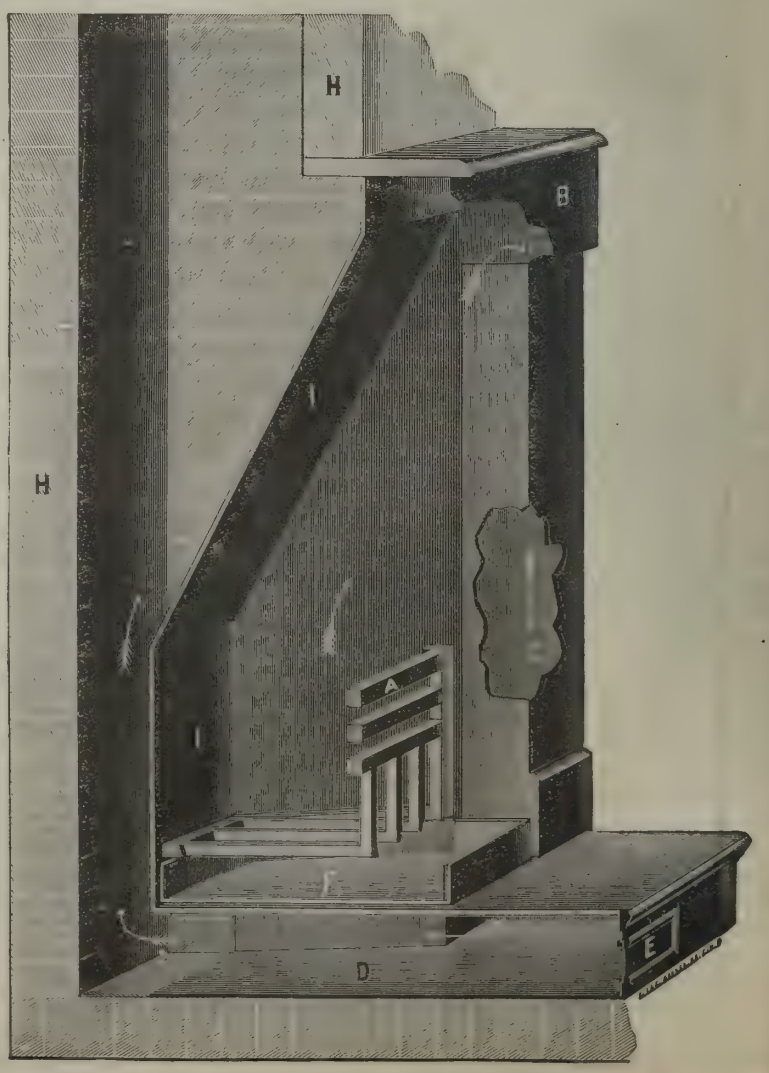


Fig. 2.—SECTIONAL VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

Plaster Work

Designs & Working Drawings.

Detail of Moulding in A.

B

A

Detail of Rosette in C

B

Wood Mouldings

Combed and Stamped Cove. on Wet Patterns

Wood

Queen Anne Motives

from Designs by E. L. Ayes.

Detail of Leaf in B

D

Detail in D

Detail in E

E

Front & Side View of Brackel for D.

Section of Cornice

Cornice to go with D

Composite Motives.

Designed by B. Day

Scientific American N.Y.

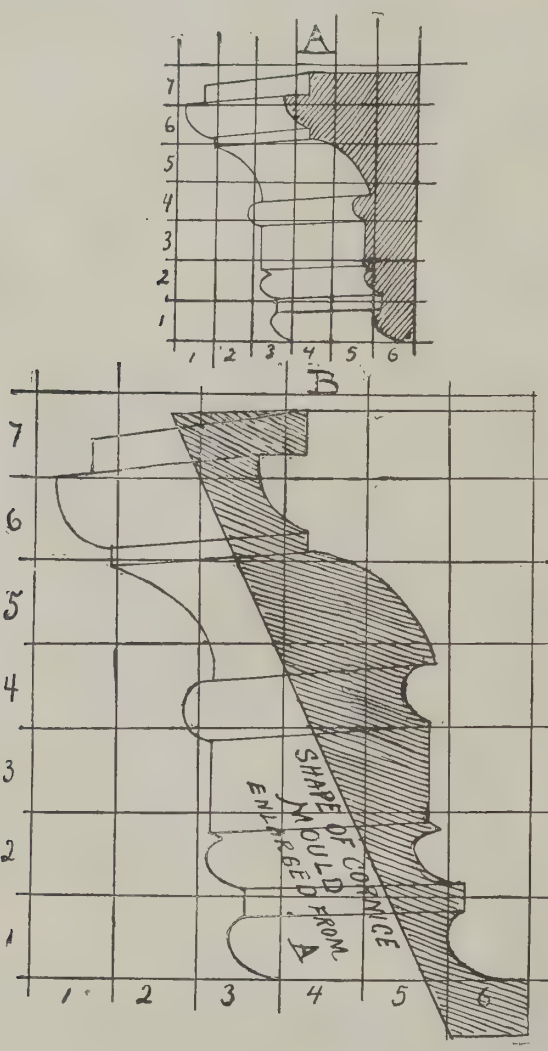
B. Day. Del 1886

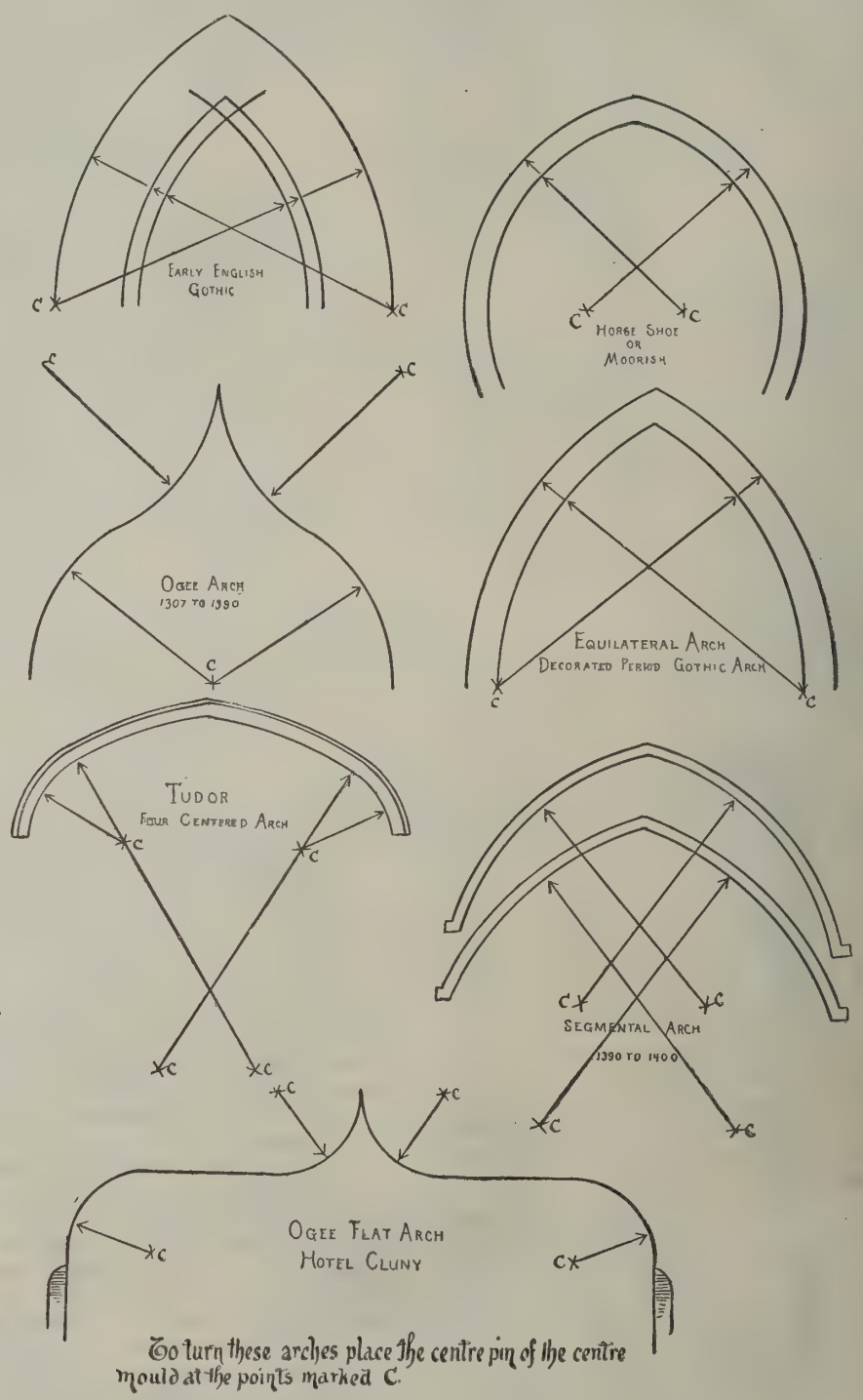
ORNAMENTAL PLASTER WORK.

The art of plastering is as old as the art of building, and yet, except in the case of expensive houses, built in or near large cities, its use is confined to the covering of flat surfaces and the running of plain cornices, very little thought being given to using its resources as a means of ornamentation. A suitably decorated ceiling, one in which the cornices have beautiful lines well proportioned to the size of the room, with an artistic center piece, is a source of never failing gratification when well conceived and artistically modeled. The reverse is true of a poor conception carried out in bad taste. The interior decorator should always bear in mind that his work is constantly before the eyes of his client, and, like the pictures on the wall, is criticised, not only by the owner, but by his friends. There is no reason why any intelligent plasterer should confine himself to flat surfaces, nor why he should not utilize his spare time in attempts at drawing, sculpture, modeling, etc. There are times of the year, when his trade is dull, which he could well employ in the study of decorative sculpture, and we propose to give him a hint how to get at it.

DRAWING

for this purpose is mostly linear or outline drawing. Any small design can be enlarged by means of the square, as shown in Figs. A and B. Make a series of squares on tracing paper that will cover the design to be copied, then divide the proposed size to which you wish to enlarge the design into a similar number of large squares, as shown in Fig. B. By numbering two sides, as shown in both diagrams, you can easily find the square you wish to copy and that portion of





ORNAMENTAL PLASTER WORK.

the design contained in such square. Copy each square until the whole design is enlarged. In the diagram, B, is also shown the manner of enlarging the shapes of cornice moulds from the designs thereof on page 75 of designs. The shaded portion represents the metal shape of the cornice mould. The outline is traced on the metal by cutting the shape out in paper and laying it or pasting it on the sheet metal of which the mould is formed.

This same method applies to designs from which you propose to model. Enlarge your design always before modeling it. It will help you greatly in its execution.

MODELING

is the shaping of any plastic material in forms either representing natural objects or combinations of beautiful shapes, termed ornaments. It is essentially a building process, and hence the reverse of sculpture, which consists in cutting away the material sculptured until the desired shape is obtained.

The mud pie and the snow man are the most primitive forms of modeling, and yet really indicate the very best method of procedure, which consists in building up the object to be modeled by the gradual addition of the plastic material to a base. The French, than whom no greater modern sculptors exist, do not cut away their clay or sculpt it, but build up their statues and designs by the gradual addition of small pellets of clay, which their fingers shape, while their eyes and minds seek the place to apply them. It is a fascinating sight to see an object take shape under the skillful manipulation of a good modeler, a sight that impels even the most timid to try their hand at it. The best part of the work is done by the thumb and fingers, and the most useful tools are those shaped like small thumbs. Of course, a variety of tools is necessary, especially in ornament. Their shapes vary from chisel shapes to small trowel shapes. The best way is to make or buy these tools as their need is felt, but, as in many other professions, the fewer the tools, the better the work.

Clay is the material most used for modeling. This can be puddled with water in a tub, allowed to settle for a day or two, then pour off the water, and use only the finer parts, which will be on the top layer, as the grit will settle at the bottom; but as it is cheap, it is perhaps less trouble to buy it already prepared. While modeling in clay, spray on water from time to time to keep the clay from cracking, but don't get it too wet. Always cover your work with wet cloths after your day's work, and if you lay it aside for a day or two, be sure and wet the cloths at least twice a day.

Wax is another material used for modeling. It requires no wetting to keep it in a plastic condition, like clay, but, being expensive, is not much used except for small work. Mr. Leonard Sence gives the following recipe for modeling wax:

Yellow wax	4 lb.
Canada balsam	1 "
White resin	1 "
Potato fecula	6 "
Four tallow candles.	

Melt the wax over a gentle fire, add gradually the balsam and resin and two of the candles, then gradually work in the potato fecula, and lastly the other two candles. Color with any finely ground innoxious pigment, such as jeweler's rouge, lamp black, indigo, etc. Lead or mercurial colors should be avoided, on account of their poisonous nature.

To cool, pour on a cold oiled marble slab, after which you work it up with your hands like dough, to get it in working condition.

The same modeling tools can be used for wax that are used for clay, the fingers of course playing the most prominent part in the work. Saliva is used on the modeling tool, to prevent the tool from adhering to the wax, although glycerine will answer the same purpose.

In this article we have given you the required hints to enable you, if you have any notion of drawing or modeling, to make an attempt at it. In our next we will endeavor to explain the processes of moulding and casting in plaster, and we hope by that time you have something modeled that you may wish to cast.

Black Birch.

The price of black birch of the best quality has recently gone up from $7 to $95 per 1,000. The extraordinary advance is due to the discovery that boards cut out of the first logs are susceptible of a very high polish, and can be used for almost any purpose hitherto exclusively reserved for mahogany, which is worth about $250 a thousand. The advance has been expedited by the discovery that the best black walnut is giving out. Black walnut from Arkansas and the South is so porous that it is of very little use in furniture making. The best black birch is found almost exclusively on the barren copper ore regions between Milwaukee and Ashland, where all other timber is stunted in growth and very poor. Here boards out of the butt cut quickly assume a beautiful red tint on being exposed to the atmosphere, and can be polished up to a great degree of fineness. The price will soon fall to $50 to $60 a thousand, as a railroad is being laid right through the very inaccessible region where it grows, and the high prices have tempted several men to open out saw mills. Red beech has also advanced in price very rapidly. It could be bought up recently in Indiana and Ohio for the bare cost of sawing, but now it is worth $30 a thousand.—*Lumberman's Gazette.*

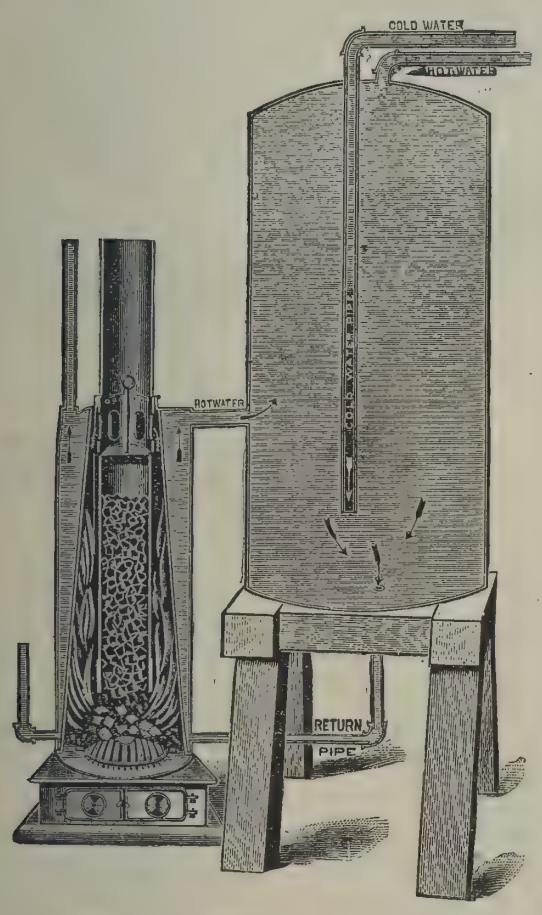
A COMBINED door plate, bell pull, and mail receiver has been patented by Mr. Michael A. McGlinn, of Lancaster, Pa. The plate has an oblong aperture corresponding with the mail-receiving aperture in the door, and a pivoted spring-actuated plate, which acts also to operate the door bell.

HOT WATER PLUMBING.

The agreeable heat which may be secured by a system of hot water, its cleanliness of operation and its noiselessness, are great items in its favor, and inquiries for systems of hot water heating are beginning to increase from clients to architects and from architects to plumbers and steam fitters.

The circulation of water is the cardinal principle in this system of heating. Plumbers are all thoroughly conversant with the fact that water may be made to circulate by the proper construction of the boiler and its accompanying pipes, but what many do not understand is that the laws which govern the circulation of heated water are so simple that any deviation from them in practice either prevents or greatly impedes the circulation. Hence it is often found by plumbers that, after great care has been taken to secure a proper construction of the system, the water will not circulate and they are unable to explain the cause. It will be the endeavor of the *Sanitary News* in this article to make these laws so plain that they may always be remembered.

The circulation of the water is caused by unequal pressure on some portion of the system. The most common system of heating water for circulation is that required in connection with the kitchen range by every modern city house. It is easily illustrated in the subjoined engraving of Wilke's circulating heater and hot water reservoir. The reason that the water circulates in this or any similar apparatus is that, when heat is applied to the water in the chamber



about the fire box, a dilation of the volume of the water takes place and it becomes lighter. The heated water rises in the chamber and finds its outlet through the short pipe leading to the boiler. The moment heat is received by the water and it becomes lighter, a change in the pressure occurs and the cold water, being heavier, begins to flow through the return pipe into the bottom of the water chamber in the heater, and this movement continues. If we suppose, for the time, that the circulating system includes nothing but the heater and the water reservoir, and that the two pipes attached to the top of the water reservoir are removed, we shall see that the hot water will flow into the reservoir and collect at the top, and the cooler and heavier water will gather at the bottom and flow down the return pipe to replace the water moving out at the top. There is nothing more simple than this movement. Persons not familar with the laws of hydrostatics might not see at a glance that the pressure would be even in this system before heat was applied, when they consider the great difference in size between the columns of water maintained in the water chamber in the heater and in the one inch return pipe. The pressure of fluids depends on the height of the column only, and is entirely irrespective of the bulk. Therefore, the one inch pipe exerts as much pressure as the much larger heating chamber.

If the pipes referred to were entirely disconnected, and the reservoir and return pipe allowed no heat to escape from the water, the circulation would take place until the water was of a uniform temperature, which would occur only when no more heat could be received from the fire, when the circulation would stop. This, however, would never occur in practical work, for the water is continually losing its heat by conduction and radiation, and a uniform degree of heat can never occur. The quicker the water loses its heat, the heavier it becomes and the more rapid the circulation becomes.

This brings us to the point where circulation of hot water throughout the house to different fixtures is desired. For this purpose, the pipes are carried from the crown of the reservoir, the hot water pipe always leading from the top of the reservoir, where the hottest water always is. The cold water supply pipe empties down in the lower part of the reservoir where the cool water is, to avoid reducing the temperature of the hot water by mixing cold with it.

It is evident, after the explanation of the pressure law of fluids, if the hot water pipe and the return pipe are carried to the same height in a building and there connected, that circulation will always result, as the pipes form a simple elongation of the two original columns of water.

In practical plumbing it is necessary to supply fixtures on different floors, and at different levels, and the question of securing a circulation becomes an important one.

The main flow pipe, after leaving the crown of the boiler, is carried horizontally to a point over the sink. Here a branch is dropped down to the level of the sink cock. The main flow pipe is then carried to the next floor, on which there are fixtures, by as direct and straight a route as possible. The pipe is led as near to the fixture as possible and a branch taken off to the cock. The main flow pipe then continues to the next floor, on which is the bath room, probably. The pipe is connected to the bath cock by as short a branch as possible, and is then carried around the side of the bath tub to the wash basin. These generally complete the fixtures to which hot water is conducted; to complete the circulation, the main flow pipe is continued directly back, without any branches, to a point underneath the boiler, where it connects with the return pipe leading from the boiler to the fire back. This system, if properly constructed, will form a circulating system which will work satisfactorily.

For convenience, the cold water pipe is constructed parallel with the hot water pipe, but it has no return pipe, and comes to a dead end at the highest fixture.

It is frequently noticed that upon opening the hot-water faucet a large amount of cold water is expelled before the hot water begins to flow. This need not necessarily be so, and if it occurs, can be remedied. It is caused by leading a long branch from the circulating system, instead of so placing the circulating pipes that a very short branch would be necessary to reach the hot water faucet.

Another annoying feature in some hot water systems is the belching of air from the hot water fixtures on the upper floor. This is because the plumber has neglected to supply an air vent at the highest point on the system. Vapor is always present in water. As it becomes heated, the air is expelled from the water and collects at the highest part of the system. Here a cock is usually placed to allow its escape. In case the water pressure in the house is from a tank, the air vent may be left permanently open, if it extends above the level of the cistern.

The pressure exerted in the hot water system of a house is principally exerted on the boiler. If the pipe leading from it is 34½ feet long from the bottom of the boiler, and is full of water, the bursting pressure on every square inch of the inner surface of the boiler will be fifteen pounds. The requirement for boilers of a good tested strength is very apparent.

In this apparatus, where hot water is continually being drawn off and is replaced by cold, there will be a greater or less deposit of mineral matter, according to the degree of hardness of the water. This is provided for to some extent by the sediment cock at the bottom of the boiler; yet the pipe which runs through the fire back is often stopped up with lime. In some localities, notably Sioux City, Ia., this deposit is very extensive, constantly requiring the substitution of new connections.

Another source of trouble with fire backs is in their freezing in severe weather. It is impossible to prevent it in houses which will not withstand the inroads of cold, except by keeping fire in the stove all night. Drawing off the water at night is futile, because it necessitates looking out for air binds; and if there is a dip, even of slight extent, in any portion of the system, it is impossible to empty the system of water, and it is liable to freeze, and to require the whole plumbing to be torn out to find the stoppage. If there is a suspicion that the water back is frozen, it is best to burn a newspaper or two under the connecting pipes. If water exposed about the room is frozen, it would be desirable to do this any way. If the lead pipe is slightly bent, the cracking of the ice inside will determine if it is frozen. If, after the fire has been burning a few minutes, the upper pipe does not feel warmer than the lower, the supposition that the pipes are frozen will be always correct.

There is one cause for the non-circulation of water in pipes which plumbers should be constantly alive to. It is that the most trivial obstruction, such as a lead shaving lodged in the pipe, in a tank system where the pressure is not aided by the pressure from the mains, may entirely prevent the circulation. This is because the motive power of the heat upon the water is so small. It is so small that an ounce, or even a fraction of an ounce, often expresses it. This small amount of motive power is easily overcome.

The velocity of the circulation is another point in which plumbers are interested. As the movement of the water is dependent upon the difference in temperature of the water in the rising pipe and in the return pipe, it is evident that any measure to maintain the temperature in the hot water pipe, such as packing, etc., and to reduce the temperature in the return pipe, such as doubling it back and forth horizontally, thus increasing its length, and increasing the amount of heat lost by radiation, will increase the velocity of the circulation, and deliver the water to distant fixtures at a higher temperature than otherwise would be the case.—*Sanitary News.*

SIMPLE METHOD OF LAYING OUT THE JOINTS IN ELLIPTICAL VAULTS.

Mr. Maurice d'Ocagne points out in the *Annales des Ponts et Chaussees* the following simple method of drawing the outlines of the joints in elliptical vaults:

Let $M_1, M_2, M_3, \ldots M_7$ (Fig. 1), be the points of

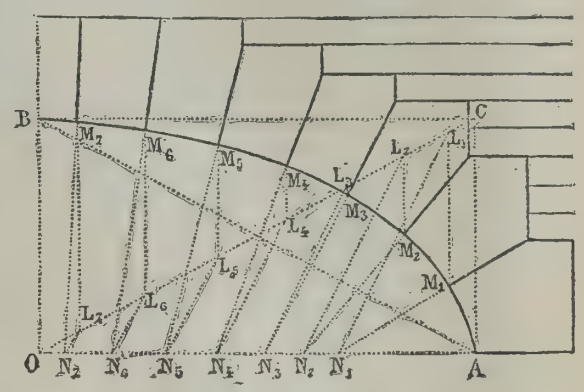


Fig. 1.

the quarter ellipse, A B, through which it is a question of outlining the joints, that is to say, the perpendiculars to the ellipse.

As the tangents at the summits, A and B, intersect each other at C, let us draw the straight lines, A B and O C.

The perpendiculars to O A, extended through the points, $M_1, M_2, M_3, \ldots M_7$, will intersect the straight line, O C, at the points, $L_1, L_2, L_3, \ldots L_7$.

The perpendiculars to A B, extended through the points, $L_1, L_2, L_3, \ldots L_7$, will intersect the axis, O A, at the points, $N_1, N_2, N_3, \ldots N_7$. The straight lines, $M_1 N_1$, $M_2 N_2$, $M_3 N_3, \ldots M_7 N_7$, are the perpendiculars sought.

In fact, let M N (Fig. 2) be the perpendicular to the

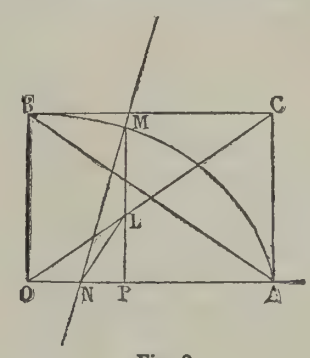


Fig. 2.

ellipse at the point, M. From the point, N, suppose we let fall upon the line, A B, the perpendicular, N L, which intersects the ordinate, M P, at the point, L.

Then, by virtue of a well known property of the ellipse, we have

$$\frac{PN}{OP} = \frac{b^2}{a^2}$$

As the triangles, P L N and O A B, have sides that are perpendicular to each other, we have also

$$\frac{PL}{PN} = \frac{a}{b}$$

Upon multiplying these equalities, member by member, we obtain

$$\frac{PL}{OP} = \frac{b}{a}$$

an equality that shows that the point, L, is situated on the straight line, O C, *quod erat demonstrandum.*

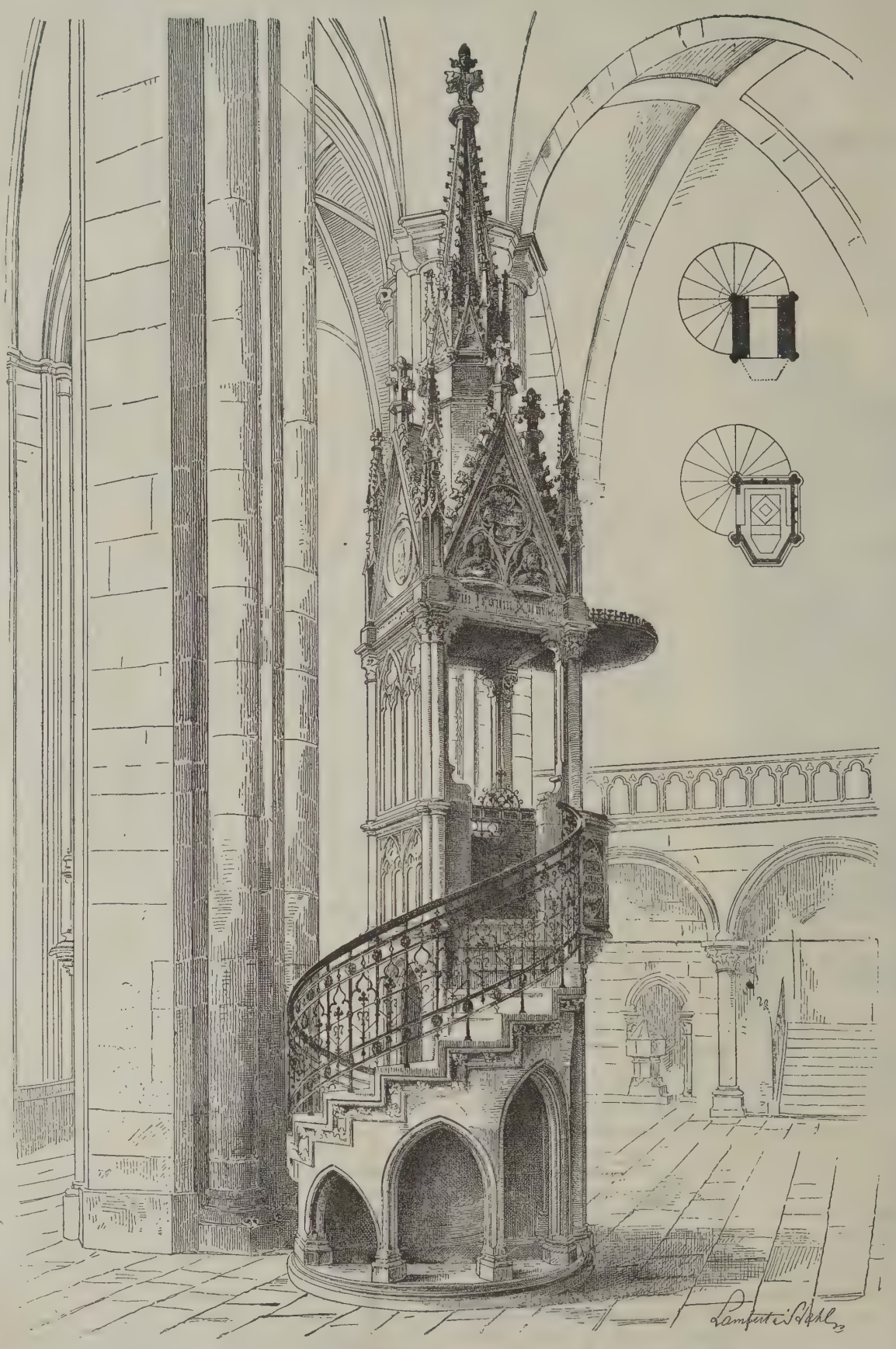
A House Designed for Future Enlargement.

We give with this number a colored plate of a house designed for future enlargement. It is complete in itself; but at some future time, when prosperity comes to the proprietor or his family increases, he may need to enlarge and extend his homestead. With our next number, May, we intend to illustrate the same house and show its plans and appearance when enlarged.

A GOTHIC PULPIT.

The architects had to solve the problem of building a stone pulpit worthy of the time-honored Church of the Holy Cross on a comparatively small space. For this reason they deviated from the ordinary design, and obtained the desired breadth by the balcony-like broadening of the platform. The platform of the old pulpit was about eight feet above the floor of the church, and the beginning of the staircase was in the massive foundation.

The center of the pulpit has a breadth of 4 feet, and it is 35 feet high, while the radius of the staircase is 4 feet. The foundation and the cluster of pillars is made of "Grisignano," and the back wall and the baldachin of "Savoniere" stone. The variegated sounding board is of wood. The dimensions of the latter are moderate, in accordance with the design, but it answers its purpose perfectly. The entire cost is about $4,600.—*Architektonische Rundschau.*



PULPIT, CHURCH OF THE HOLY CROSS, LOWER AUSTRIA.—AVANS & LANGE, ARCHITECTS, VIENNA.

Hints on Building.

Put up the frame and get a roof over it as soon as may be, say in May or earlier. Then let it stand until the first of September to season. This is the old fashioned way, and it has advantages which those who have had experience with shrinking timber will not be slow to appreciate. In this part of the country the timber for a frame is always green when it is put up. Indeed, hemlock could not be worked very well dry. It is much better to have the shrinkage done before the inside finish is on than after.

All floors should be double. A layer of sheathing paper between them would not be a bad idea, and would pay for itself. The upper floor ought to go down after the mason work is done. A smooth, nice floor is a great preserver of carpets.

Back of the wash boards the space should be filled in with bricks. The ends of the floor timbers ought to be filled in such a way as to prevent rats and mice from having a free passage. Such a filling greatly diminishes the danger from fire.

Do not let the tinman or the contractor persuade you that the gutters should be left until red with rust before they are painted. It is a plan which is designed to benefit them exclusively. The paint goes on more easily after the red rust begins. The tin, however, has begun its own destruction, and will go on rusting under the paint just as steadily as though it had no protection, though perhaps not quite so fast. Tin roofs should not be allowed to get red. They can be cleaned and painted on one side in the shop. The objection to this is that the resin or acid (none of the latter should be used) needs to becleaned off by the rains, so that the paint will stick. The best plan is to have the cleaning done at once, without waiting for the rain.

All piping should be put into the house while it is in the frame. This saves expense and much cutting of woodwork. Alongside each chimney it is a good plan to have a space extending from floor to floor in which pipes can be run if desired. The chimney breasts and the spaces which they cover ought to be plastered on wire lath, for safety, and thus avoid shrinkage.

Have a spare flue in each chimney, to be used for ventilation. The open fireplace, as a ventilator, however, is a delusion. Make openings into the flue at the base board, and by proper management of doors and windows, perfectly pure air can be secured in every room.

Heat by a big hot air furnace several sizes larger than the furnace makers recommend. This furnishes the means for perfect ventilation, by providing an ample supply of warm, pure air. Keep the pipes and registers perfectly clean, or the smell of cooked dust will be mistaken for that bugaboo "burnt air."

In plastering do not use a "brown coat" of mortar. Put the finish directly on the "scratch coat." Time, labor, and patience will be saved, and the work will be better, harder, and more durable. Build the foundations for the piers, in the cellar, with as much care and deeper than those of the external walls. These piers support the center of the house, and they are frequently neglected. The result is a great crop of cracks in the plaster.

Have the walls of the upper floor 9 feet high in the clear, even if you have to cut off six inches from the floor below. This is of course for a moderate size of house. High ceilings for sleeping rooms tend toward giving the sleepers purer air by furnishing greater space. When one is drawing plans, it is best to consult with a carpenter and see whether the framing will come out even multiples of commercial lengths. It is sometimes cheaper to use the full lengths of the timber than to cut off six inches from the ends. Increasing the size of a house six or eight inches may frequently be done without any appreciable addition to the cost.

In designing, get the inside arrangement right. Have places for every piece of furniture. Arrange the bedrooms so that they will contain beds without putting them against doors or windows. Put them against inside walls if possible. Have some connecting rooms and some which do not. After all this is done, put the outside on. Let doors and windows come where they will, and do not spoil your own comfort for the sake of an external appearance which is for the benefit of your neighbors.

Lastly, have a garret by building a sharp roof. Cover the roof with dark colored slate from Maine or Vermont. Lay it in cement, and be happy.

Moral: Alterations on paper cost much less than those in wood and stone. Therefore it is better to spend a long time over the plans than to make changes on which the builder charges his own price.—*The Mechanical News.*

A STONE AND BRICK COTTAGE.

This house, which belongs to Mr. J. N. D'Andrea, is built on the Basque principle, under one roof, with covered balconies on the south side, the north side being kept low to give the sun an opportunity of shining in winter on the house and greenhouse adjacent, as well as to assist in the more picturesque grouping of the two. On this side is placed, approached by porch and lobby, the hall with a fireplace of the "olden time," lavatory, etc., butler's pantry, vater closet, staircase, larder, kitchen, scullery, stores, etc.

On the south side are two sitting rooms, opening into a conservatory. There are six bed rooms, a dining room, bath room, and housemaid's sink.

The walls are built of colored wall stones, known as "insides," and half timbered brickwork, covered with the Portland cement stucco, finished Parian, and painted a cream color.

All the interior woodwork is of selected pitch pine, the hall being boarded throughout. Colored lead-light glass is introduced in the upper parts of the windows in every room, etc.

The architect is Mr. W. A. Herbert Martin, of Bradford, England.—*Architect.*

Slate Roofs.

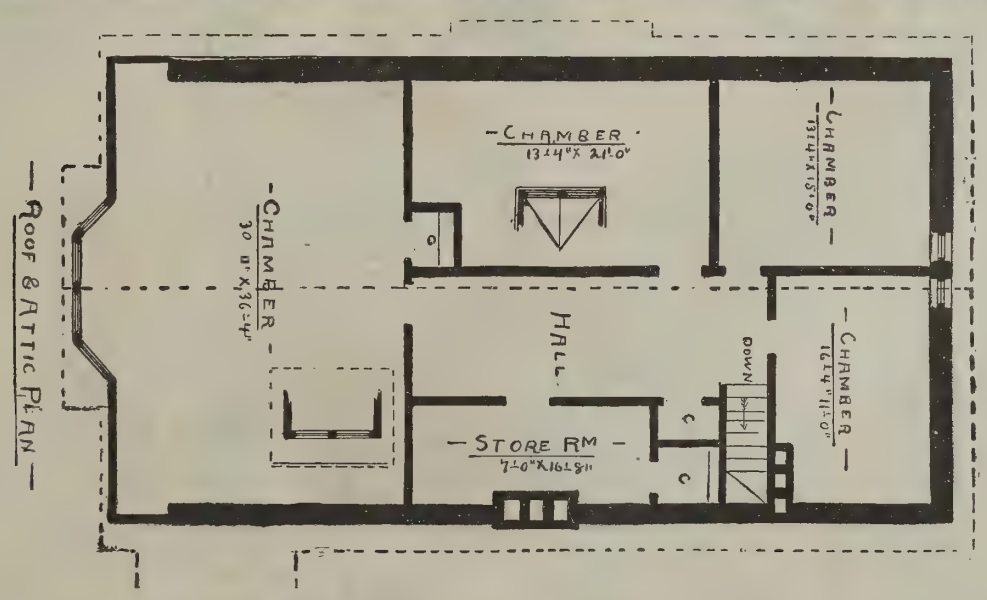
C. C. B., of Jackson, Mich., wishes to know (1) of any way to fix a slate roof so it will not leak, or (2) of any paint or preparation that a roof can be covered over with, to prevent the water from working back up under the slate.

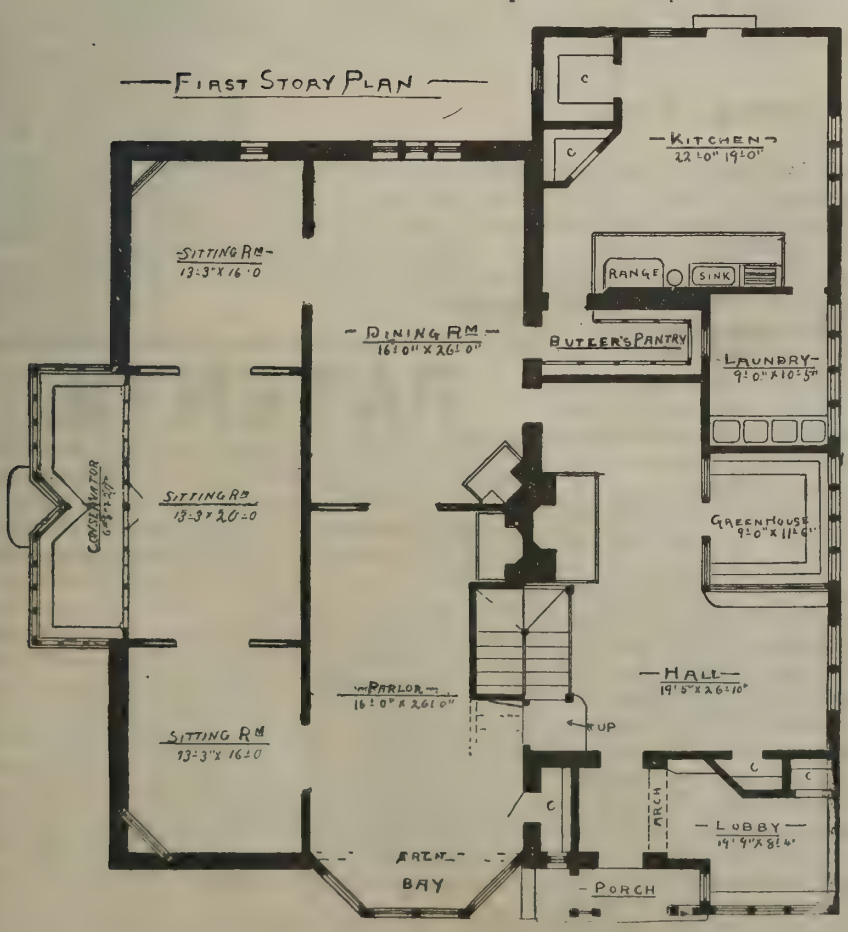
(1) When slates are laid upon a board roof, the boards should be covered with waterproof bitumenized felting, overlapping on the incline of the roof. If upon battens, a sheet wire netting can be stretched from batten to batten to keep the felt from sagging, and the slates laid with the proper tilt to make the tails lie close.

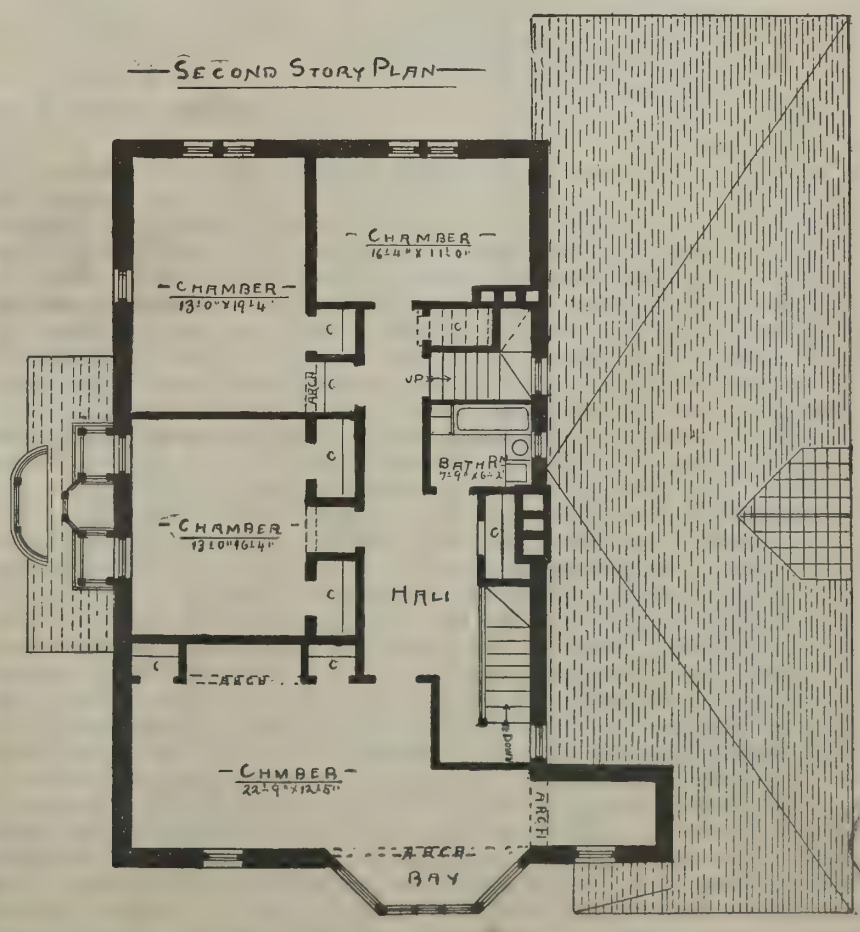
(2) To keep out draughts, as well as a special precaution against leakage occurring on exposed sites from driving rain or melting snow, the slates are often pointed with hair mortar on the inside, or *torched*, as it is termed; or they may be shouldered or bedded for about two inches at their heads in hair mortar, generally mixed with coal ashes, *which have been sifted and washed*, to give a good slate color, and this method is more effectual than mere pointing, as it does not get loose nor drop out, while it tends to keep the *tails* or *feet* of the slates down tight.

Sometimes the slates are rendered on the under sides with hair mortar, both to keep out the weather and maintain a more equable temperature within.

If the slates are already laid, pointing must be resorted to as suggested, but there is a cement for pointing which has been in successful operation in this country and England for a long time, and it is superior to hair mortar. It is this: Take equal parts of whiting and dry sand, and 25 per cent of litharge, made into the consistency of putty with linseed oil. Use just enough sifted and washed coal ashes, in addition, to give the mixture a good slate color. It is not liable to crack when cold, nor melt like coal tar and asphalt with the heat of the sun.







A STONE AND BRICK COTTAGE.

Redwood Logging in California.

The whole world concedes to America pre-eminence in the size of her trees available for timber. In no part of the world are trees to be found equaling in size the forest monarchs of California, save in certain parts of Australia and Tasmania, where the eucalyptus trees grow, perhaps, to equal dimensions, but the wood of the eucalyptus is gnarled and worthless, twisting and warping if used. California's big trees are of two varieties, the Sequoia gigantea, the most celebrated examples of which are found in the vicinity of the Yosemite, and the Sequoia sempervirens, or redwood, which, through extending from the vicinity of Santa Barbara on the south to Oregon on the north, are found in greatest size in Humboldt County. In the early English works on phytography, it was sought to link the name of their great Wellington to the trees of the Yosemite, but now it is agreed that to the father of the American nation this honor appropriately belongs, and the name of Washingtonia gigantea is now coming into favor in popular and scientific usage.

In the forests of Norway, Sweden, and Finland, the great timber-producing countries of northern Europe, the standard width of boards is 6 inches, and trees larger than 8 to 10 in. diameter are unusual. Several years ago a large American locomotive establishment shipped a cargo of locomotives to Hangho, the terminus of one of the Finnish railways. They were packed in boxes of Michigan two inch pine plank, many of them 15 in. to 18 in. or more in width. Boards of this extraordinary width attracted much attention, and an employe of the railway obtained sufficient of the empty boxes and fashioned them into a house—the best in the place—and people came in considerable numbers to marvel at trees which could produce boards like those The thrifty housewives greatly prized pieces of the same boards for making moulding boards and many were distributed for this purpose. If our ordinary lumber of commerce could excite such surprise, how much greater the astonishment and admiration of the same people at California's wonders!

An American gentleman was once waiting at a Russian custom house to have his effects examined and passed. As he opened his trunk a photograph of one of the great trees was lying on top exposed to view. The inspector examined it eagerly. "Ah," said he, "that is from California. I have a brother there who has written us at home much about them, but we could not credit it. I have never seen a photograph of them."

The picture was presented to him, whereupon work was suspended until it had been handed about and discussed by all, up to the chief of the custom house. The photograph showed a great tree partially cut for felling, with twelve persons sitting uncrowded in the V-shaped cutting. This calls to mind a *bon mot* of the late George Whitney, of Philadelphia, who, on seeing the same photograph, exclaimed, "Why, it is a photograph, but it really looks like a wood-cut!"

A peculiarity of the redwood forests is the absence of undergrowth. It is, therefore, difficult to realize their magnitude without a familiar object near by with which to compare them. Until one begins to make such a comparison the trees do not appear of extraordinary size. Like the cataract of Niagara, the first view is frequently disappointing, and familiarity, far from breeding contempt, serves to increase the feeling of awe inspired by overpowering magnitude.

In consequence of the great size of the redwood, the process of getting the logs to the mills has been a slow and expensive one. Floating has been impracticable, owing both to the size and the weight of the logs, even where there are streams. Hence, logging railroads are in California a necessity, instead of an economic convenience, as in the pine forests east of the mountains. Many of the readers of the *Lumberman* are familiar, by pictures and otherwise, with the old methods in use on the coast In some cases long lines of oxen laboriously drag the logs through the woods, and in other cases tackling, operated by cattle or mule power, or sometimes by donkey engines, is employed to load the logs. But those methods are too slow, and are being superseded by steam power conveniently applied.

The necessity for some special means of handling these great logs led Mr. John Dolbeer, a large lumber operator of San Francisco, to think of attaching a steam windlass to an ordinary locomotive. A patent was granted him for a device by which the steam windlass could be thrown into gear with the driving wheels of the locomotive for the purpose of propelling it, or could be used separately for its legitimate work of lifting and handling logs. Since then the Baldwin Locomotive Works, of Philadelphia, have built, for logging railroads on the Pacific coast and elsewhere, a special type of double-end logging locomotives, equally adapted for running in either direction, and equipped with a powerful steam windlass at the forward end. Unlike Dolbeer's locomotive, however, the windlass is entirely disconnected from the driving gear of the locomotive, and the locomotive can be built either with or without it. The locomotives referred to have two pairs of driving wheels coupled and a two-wheeled or pony truck at each end. A saddle tank carries the water, and the rear truck carries a large wood box. The forward truck is center bearing, the rear truck side bearing. The wheel base is extended sufficiently to distribute the weight of the engine over a good length of track, while at the same time it is perfectly flexible, allowing the locomotive to run on the roughest track and pass the shortest curves with ease and without injury to itself or the track. A powerful steam brake acting on both pairs of driving wheels controls the motion of the engine on steep grades, and serves to lock it firmly while the windlass is in operation. The windlass is a Copeland & Bacon six inch double cylinder, with single or double gearing, as the weight of the logs to be handled requires.

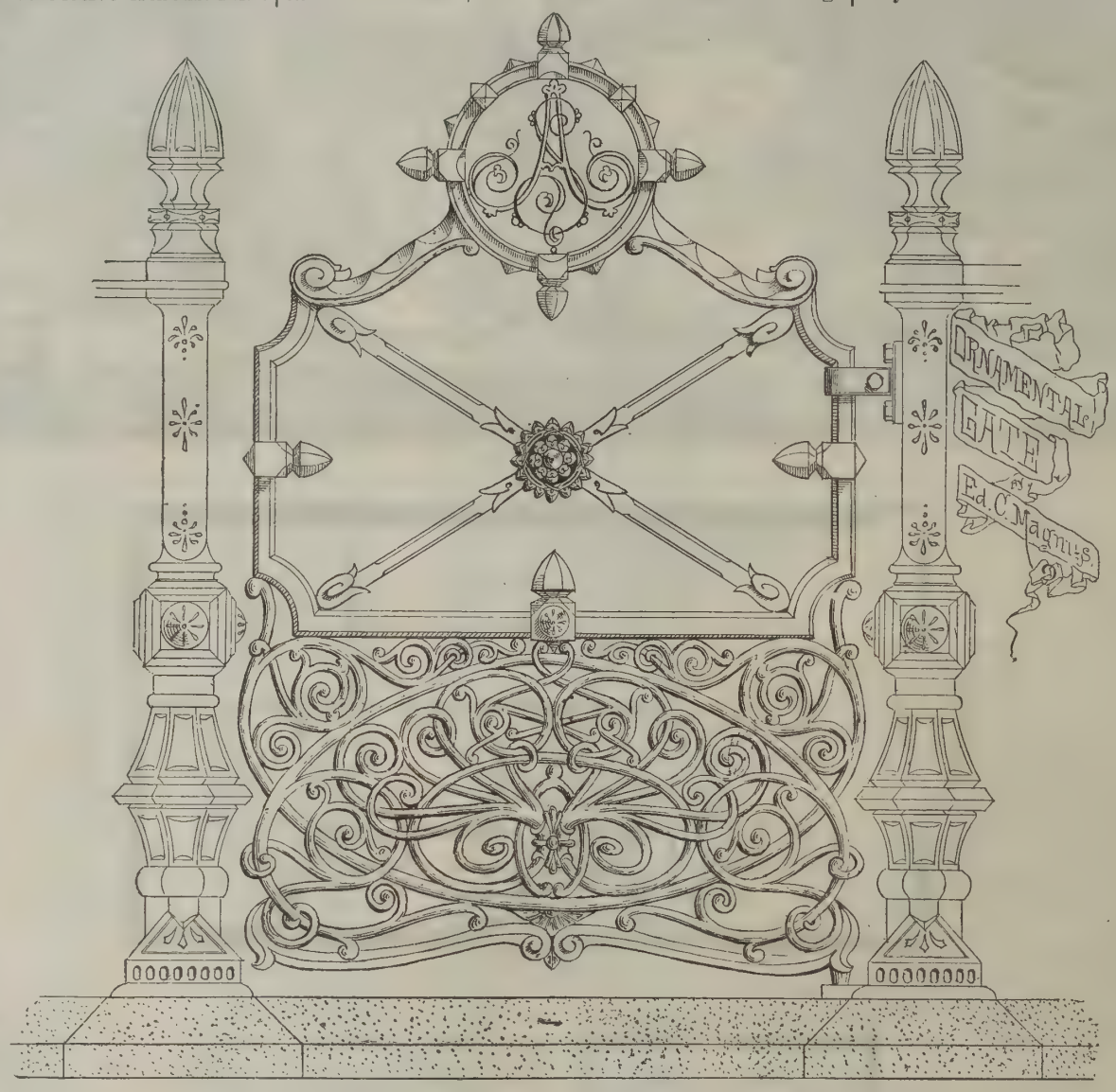
Some of the green redwood timber is very heavy, and will sink when put into water. The logs handled frequently weigh from twenty to thirty tons.

Redwood is the common lumber of the Pacific coast, taking the place of the pine and hemlock of the Eastern States and the deals of England. It is used for clapboards, siding, shingles, in fact for every purpose where it is not subject to wear. When dried, it is quite soft, and wears rapidly by attrition; it is, therefore, unsuitable for flooring or stair purposes. It is used to some extent for railroad ties, though not so well adapted to this service as harder woods. Particularly on curves, the spikes become loosened by the lateral pressure against the rails. Redwood is remarkable in that its shrinkage is mainly in the direction of its length. Though its grain is usually straight, it can be found with grain curled, bird's eye, and other fantastic shapes, rivaling in this respect the most beautiful bird's eye and curly maple. Its rich color, much resembling red cedar, its beautiful grain, when carefully selected, and its great durability, when not subject to wear, make it most desirable for interior decoration. With the low transcontinental freights now ruling and likely to continue, it must become recognized in the Eastern States as a wood rich in economic and ornamental possibilities.—*Lumberman.*

Grano-Metallic Stone.

The grano-metallic stone, the invention of Mr. J. H. Bryant, of London, is composed of blast furnace slag and granite, which are crushed, chemically treated, dried, and mixed with Portland cement. For use these ingredients are brought to a pasty consistency with an alkaline solution, and laid. It possesses the important property of always having a rough surface, which is due to the atoms of the vitreous slag always presenting themselves just above the other ingredients, which are more readily worn. This stone has undergone a special trial in one of the metropolitan gas works, where a section was laid at the request of the engineer. It was there successfully subjected to tests which natural and artificial stones have, it is stated, been unable to withstand. It is found to stand not only the wear and tear of heavy horse and van traffic, but the sudden and extreme alternations of temperature incident to the slaking of coke upon it. Valuable as this material has proved itself for paving and road making purposes, however, it has now been proved to possess the additional important feature of being highly refractory.

A cement kiln lined with this stone has stood a number of burnings without any repairs having to be done. Even where the lining happened to be torn away by a portion of adhering clinker, there is not the least sign of the stone having been injuriously acted upon by the heat. This is certainly a most crucial test, and the satisfactory manner in which the stone has passed through it stamps it at once as an absolutely fire proof material, and, therefore, of special value for constructive purposes.—*Iron.*



DESIGN FOR AN ORNAMENTAL GATE.

ORNAMENTAL IRON GATE.

I send you a design of the gate belonging to the railing which was illustrated in your building edition for August, 1886, and which shows the crossed bars in the upper part.

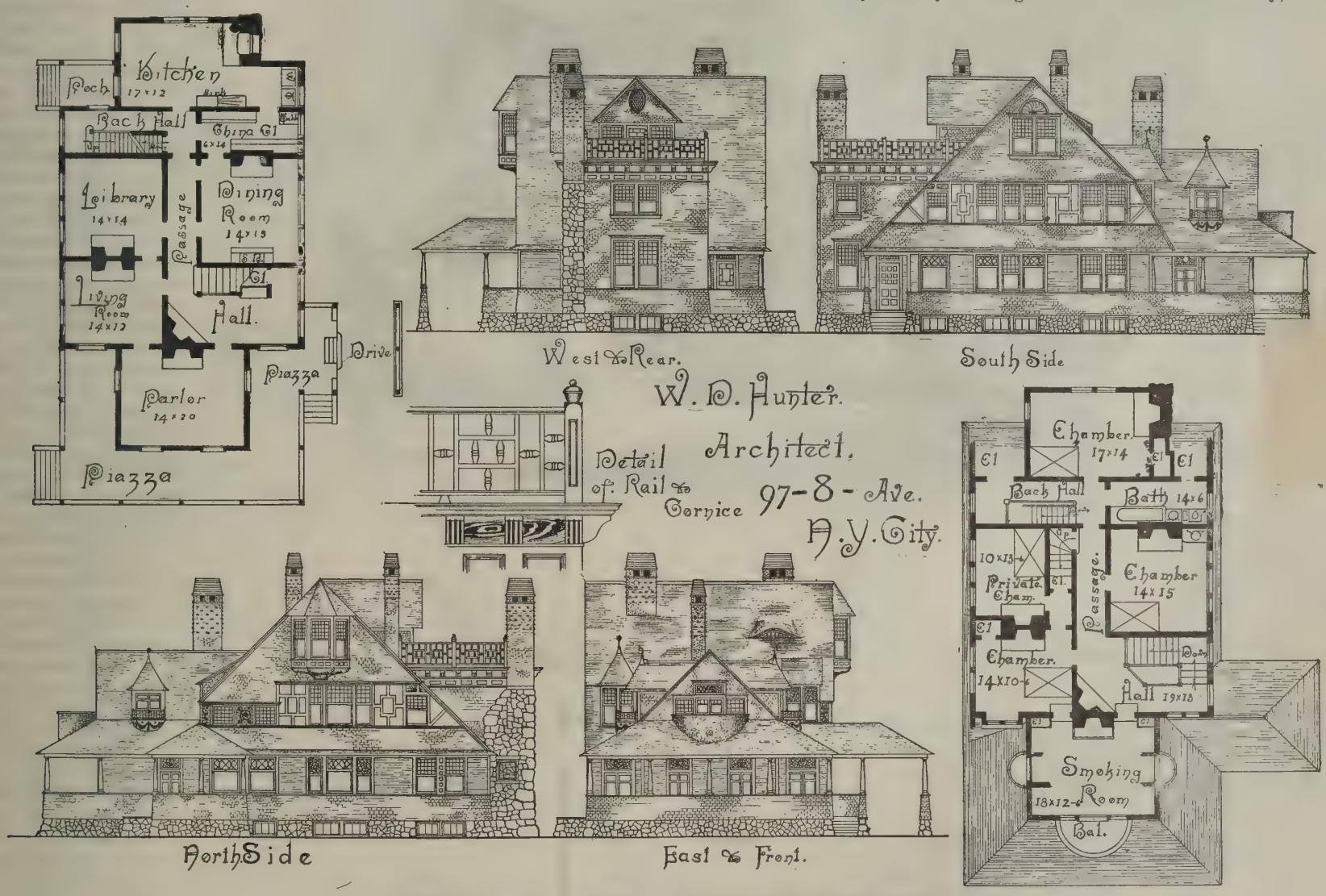
In designing this gate, my endeavor has been to adhere as closely as possible to the outlines of the posts. All the cornered work (posts, etc.) is *octagonal.* In carrying out the design, the cast iron scroll work shown as of a circular or oval section in the drawing was made grooved and with edges rounded. The groove following all the contortions brings well out the intersections.

Ed. C. Magnus.

Crefeld, 1887.

DWELLING FOR AN ELEVATION.

This dwelling was designed by Wesley D. Hunter, architect, 97 Eighth Avenue, N. Y. City. It has a large hall and convenient porch. Rooms are large and well lighted, with plenty of closet room. The front faces the east and the rear is to overlook a valley. The roof of the rear projection is to answer the purpose of a tower. It is estimated to cost $7,000 to $8,000.



DESIGN FOR A DWELLING FOR AN ELEVATION.

Left-Handedness.

Dr. Daniel Wilson, president of the Royal Society of Canada, has lately contributed a paper to the *Proceedings* of that society on the subject of left-handedness, to which he has managed to give an unexpected and very practical interest, affecting all who have children or who are concerned in their education. The author had written previously on this subject, but not with such full and effective treatment. He reviews the various causes to which the general preference of the right hand has been ascribed, and also those to which the occasional cases of left-handedness are attributed, and finds them mostly unsatisfactory. He shows clearly that the preferential use of the right hand is not to be ascribed entirely to early training. On the contrary, in many instances where parents have tied up the left hand of a child to overcome the persistent preference for its use, the attempt has proved futile. He concludes that the general practice is probably due to the superior development of the left lobe of the brain, which, as is well known, is connected with the right side of the body. This view, as he shows, was originally suggested by the eminent anatomist, Professor Gratiolet. The author adopts and maintains it with much force, and adds the correlative view that "left-handedness is due to an exceptional development of the right hemisphere of the brain."

A careful review of the evidence gives strong reason for believing that what is now the cause of the preference for the right hand was originally an effect. Neither the apes nor any others of the lower animals show a similar inclination for the special use of the right limbs. It is a purely human attribute, and probably arose gradually from the use, by the earliest races of men, of the right arm in fighting, while the left arm was reserved to cover the left side of the body, where wounds, as their experience showed, were most dangerous. Those who neglected this precaution would be most likely to be killed; and hence, in the lapse of time, the natural survival would make the human race, in general, "right-handed," with occasional reversions, of course, by "atavism," to the left-handed or, more properly, the ambidexterous condition. The more frequent and energetic use of the right limbs would, of course, react upon the brain, and bring about the excessive development of the left lobe, such as now generally obtains.

The conclusions from this course of reasoning are very important. Through the effect of the irregular and abnormal development which has descended to us from our bellicose ancestors, one lobe of our brains and one side of our bodies are left in a neglected and weakened condition. The evidence which Dr. Wilson produces of the injury resulting from this cause is very striking. In the majority of cases the defect, though it cannot be wholly overcome, may be in great part cured by early training, which will strengthen at once both the body and the mind. "Whenever," he writes, "the early and persistent cultivation of the full use of both hands has been accomplished, the result is greater efficiency, without any corresponding awkwardness or defect. In certain arts and professions, both hands are necessarily called into play. The skillful surgeon finds an enormous advantage in being able to transfer his instrument from one hand to the other. The dentist has to multiply instruments to make up for the lack of such acquired power. The fencer who can transfer his weapon to the left hand places his adversary at a disadvantage. The lumberer finds it indispensable, in the operations of his woodcraft, to learn to chop timber right and left handed; and the carpenter may be frequently seen using the saw and hammer in either hand, and thereby not only resting his arm, but greatly facilitating his work. In all the fine arts the mastery of both hands is advantageous. The sculptor, the carver, the draughtsman, the engraver, and cameo cutter each has recourse at times to the left hand for special manipulative dexterity; the pianist depends little less on the left hand than on the right; and as for the organist, with the numerous pedals and stops of the modern grand organ, a quadrumanous musician would still find reason to envy the ampler scope which a Briareus could command."

That all this is true is abundantly shown by the numerous examples cited by the author, from the greatest of artists, the left-handed Lionardo da Vinci, to the distinguished ex-president of the American scientific association, Prof. Edward F. Morse, and (we may add) to Dr. Wilson himself, both of whom are known to be accomplished draughtsmen with this too-neglected hand. In view of these facts, it is evident that few more important subjects can be offered for the consideration of educators than that which is presented in this impressive essay.—*Science.*

The Building Employers' Protective Association.

After much deliberation and discussion, and with a unanimity of purpose peculiarly gratifying among such widely diversified callings, the various employing interests constituting the building trades of New York have resolved to organize into an association, having for its primary object the benefit of the workingman. Master painters, master plumbers, real estate dealers, carpenters, iron workers, framers, architects, masons, builders, roofers, plasterers, gas fitters, stair builders, elevator builders, marble workers, steam fitters, bluestone cutters, artificial stone manufacturers, furnace and heater makers and setters, and dealers in plumbers' materials, are all represented in the Building Employers' Protective Association, and its first object is to insure to masters the right to employ whomsoever they will, regardless of union dictation.

The importance of the step thus taken cannot be overestimated. Although there is to be no interference between employers in the different branches of business on questions of wages or hours of labor, the federation, if honestly adhered to, will really control these factors.

Nowadays, if a master is asked to pay wages he considers too high, or to work such short hours as to endanger the fulfillment of his contract, he is coerced into agreement by threats of a strike. He knows that if he lets his union workmen go he is placed at a disadvantage, for all the union workmen of other denominations engaged on his buildings will refuse to work with non-union men, and in this manner heavy pressure is brought to bear on the employer of the strikers. Not only this, but the support one branch of trade furnished another tended to prolong strikes unnecessarily and augmented the trouble.

The workman unquestionably has the right to sell his labor at the highest price it will bring, nor do we deny his claim to say how many hours he will work, or under what conditions his labor shall be performed. Here, however, the limit of his prerogative, as dictated by the usages and necessities of society, is fixed. He has no right to step beyond it and tell his employer that no other man shall work for him if he does not choose to do so. In doing this, he perpetrates an injustice on the employer and on every non-union workman, no matter what his reasons may be for not joining a labor organization. As well might the butchers and bakers combine to dictate where and of whom necessary articles of food should be purchased.

It is this abuse of the power of organization the Building Employers' Protective Association has been organized to combat. To its members, just as much as to the Knights of Labor, or any other faction among workers, the injury of one is the concern of all. A strike against the employment of non-union men is probably to be followed by a lock-out of all striking trades, and in this manner the right of a master to employ whomsoever he chooses will be asserted. There will be no limit prescribed as to the right of workmen to strike, but they must not interfere with those taking their places—in other words, the members of this association declare the labor market open to everybody, and guarantee fair treatment to all that may enter it. —*The Sanitary Plumber.*

It is probable that the artesian well now being bored at Pesth will be the deepest in the world, having indeed already reached a point entitling it to this prominence. It is sunk for the purpose of supplying the baths and other public establishments with hot water, the temperature aimed at being 176°, with a volume sufficient for the wants of the whole city.

A CHURCH OF MODERATE COST.

SPECIFICATION

of the work and materials required in finishing St. Andrew's Church, at Phenix, R. I., in accordance with drawings prepared by Messrs. Wm. R. Walker & Son, architects, Providence, R. I.

Furring.—Furr the walls of all rooms straight and true for lathing. Furr the ceilings of all rooms with ⅞ in. by 2 in. spruce furring strips, 16 in. from centers. Put up straight and true, and strongly nailed.

Grounds.—Put on ⅞ in. by 2 in. spruce grounds at the top line of base boards and chair or surbase moulding, and around the sides and tops of all doorways.

Partitions.—Partition the interior, as shown on floor plans, with 2 in. by 4¾ in. spruce partition studs, set 16 in. from centers, with two rows of 2 in. by 2 in. cross bridging in the height of same, and the studs doubled at the side of all doorways.

Lathing.—Lath the walls and ceilings of all rooms with five foot spruce laths, four nailings to each, and the end joints broken at every three laths, and the side joints laid 1¼ in. open.

Plastering.—Plaster all the walls and ceilings one good coat of brown plastering mortar, made from slaked, screened, and puttied lime, clean, sharp grit sand, and long cattle hair, mixed in suitable proportions for making strong mortar, and tempered with clean water. To be well rubbed into the joints between laths, forming good, strong clinches back of the same. To be trowel smoothed to a hard, even surface, when the mortar is in the proper state, so as to do without water in the smoothing. All angles to be screeded with long straight edges, and left clean, true, and straight.

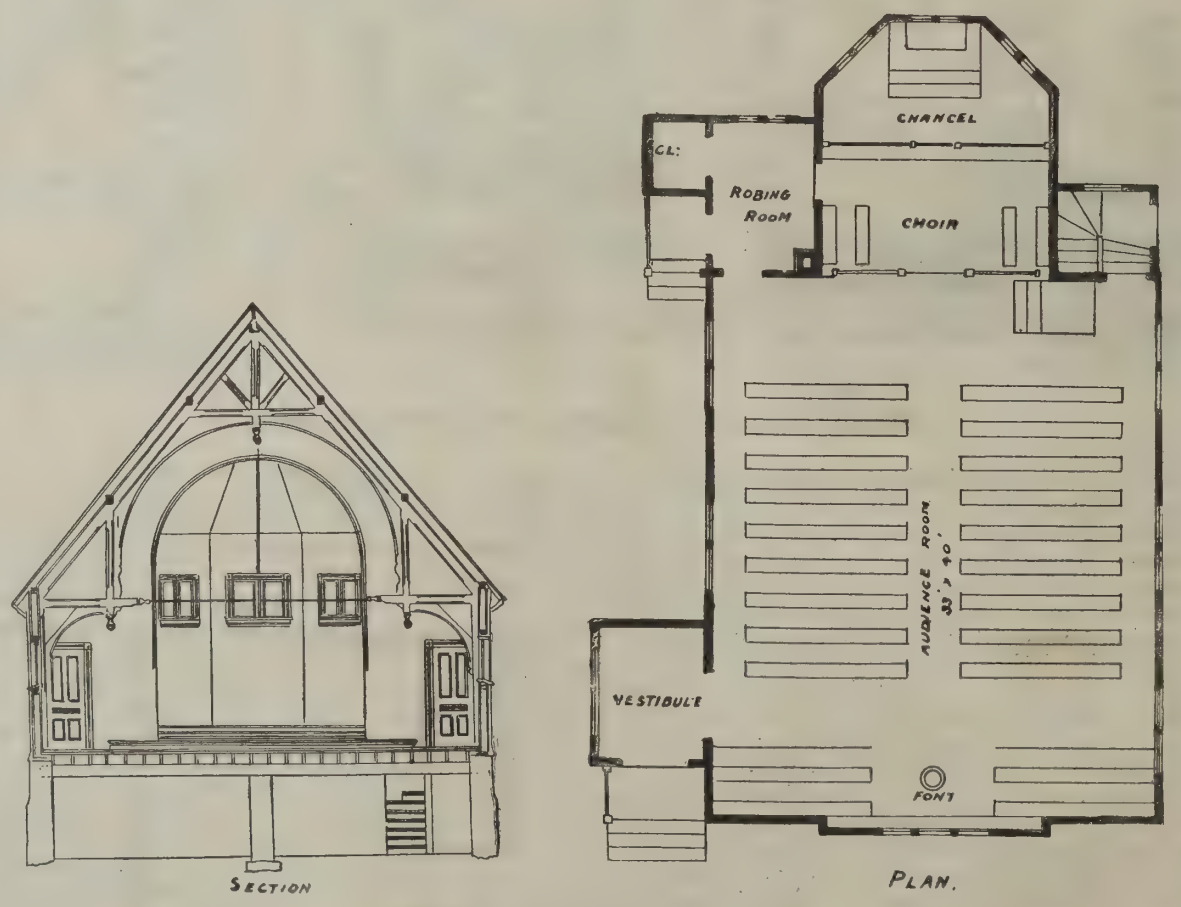
Chancel Arch.—The chancel arch to have stucco mouldings run around the corners of same, and left true, clean, and smooth. In the angle of wall and ceiling of chancel run a plain moulding stucco cornice, 8 in. down on walls by 12 in. out or up on ceiling. The plasterer to clean out and sweep out the mortar and plasterer's rubbish from the building as soon as his work is done, and to cover the glass in windows that are glazed, to prevent spattering of mortar thereon, and to protect walls from frost.

Interior Finish.—The interior of building to be finished in clear, dry seasoned and kiln dried white pine. The architraves around doors and windows to be ⅞ in. thick by 6 in. wide, with turned angle blocks at the top corners. The stool casings to be moulded with moulded apron under same. The base boards to be ⅞ in. thick by 10 in. wide, with a ⅞ in. by 3 in. moulding top of same. The surbase moulding around the walls of auditorium and chancel to be ⅞ in. thick by 6 in. wide, with moulded edges and faces. At all external corners, between base and surbase, put in turned white pine corners 1¾ in. in diameter, with 2¾ in. turned heads at both ends. Thresholds to be clear Southern hard pine ¾ in. thick.

Floors.—Furnish and lay down the top floor of all rooms fine, clear, dry seasoned and kiln dried matched ⅞ in. Southern hard pine of the best quality, to be blind nailed into every floor joist, and the joints planed off level and smooth. The flooring of chancel to be raised up one step high at each break shown on floor plan, and the front edge of step moulded with a cove under same.

Doors.—The inside doors to be made from clear white pine, of the sizes and forms shown on plans, to be 1¾ in. thick, with moulded panels, to be hung to frames with stout 5 in. by 5 in. japanned and nickel tipped butts, and trimmed with lock, latch, and plain brass 2¼ in. knob. There will be no door between the robing room and chancel, the opening to be cased up same as other doors, but without rabbet in the jamb.

Finally.—All work to be done in a good and workmanlike manner. All the mouldings to be sandpapered clean and smooth, and the back edges jointed smooth.



A CHURCH OF MODERATE COST.

THE new "*Cement de Paris*," says *Construction Moderne*, which, it is claimed, besides being water proof, has other important points of superiority, is made by pulverizing the stone while roasting in the kiln, instead of afterward, as is the case with common lime.

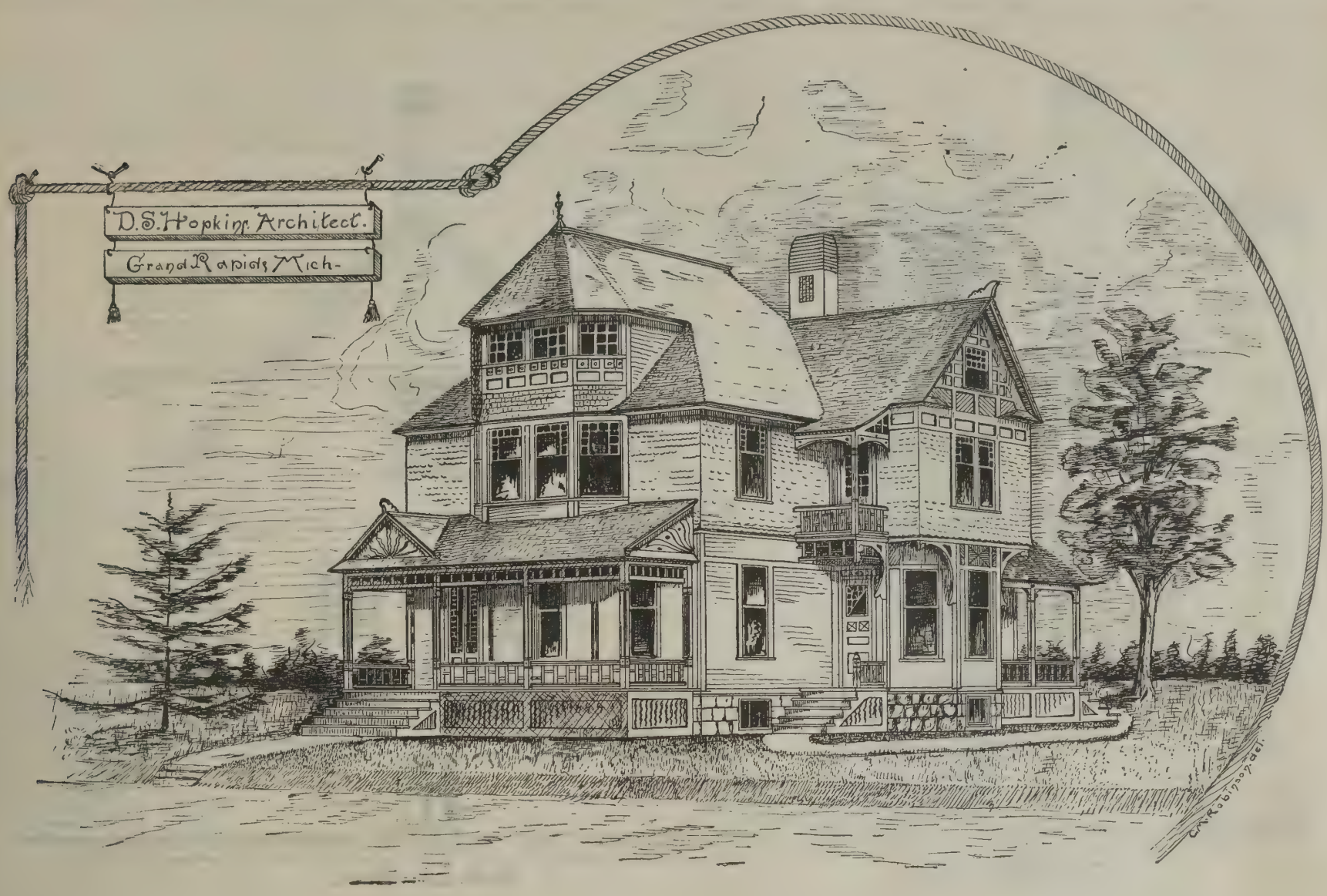
A $3,000 RESIDENCE.

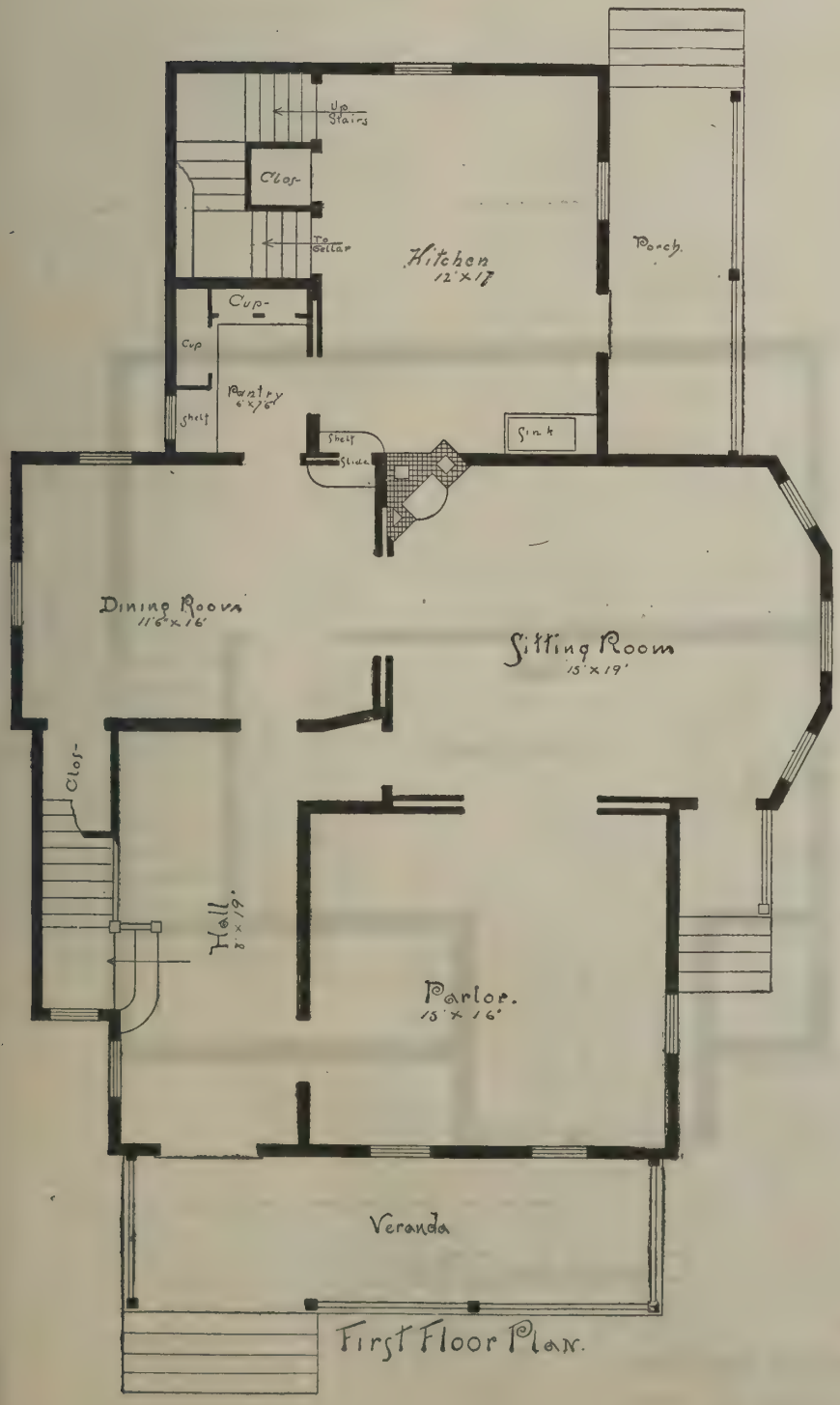
This cottage, designed by D. S. Hopkins, architect, Grand Rapids, Mich., is built of wood. Stone foundations. Cellar under entire house, with brick partitions in same. The frame is sheathed with matched pine, and paper lined throughout. First story is inclosed with 4 in. pine siding, second story shingled with best fancy cut pine shingles. Roofs are covered with the best pine shingles. The house is to be painted in three bright harmonious colors.

The interior shows rooms all of good size, and conveniently arranged. The first floor principal rooms are thrown together with sliding doors. Front hall is large. Stairs of good width and easy run. The kitchen is large and is provided with all conveniences, closet, etc., with stairs to cellar and second floor. The second story principal rooms are all of good size and provided with closets. Bath room is convenient and well ventilated. The front rooms have a bay projection, which extends up to roof, and makes a very pleasing feature on the exterior, and also gives a very pleasant attic room, large enough for a billiard room or for any other uses, as desired. The heating of this dwelling was designed for furnace, and has but one chimney on that account. Another chimney could be provided for, when stove heating is desired. The inside finish is neat and plain. Pilaster style of finish, all pine finished in natural wood or painted, as preferred. This house all complete, including plumbing (without heating), is estimated to cost three thousand dolars.

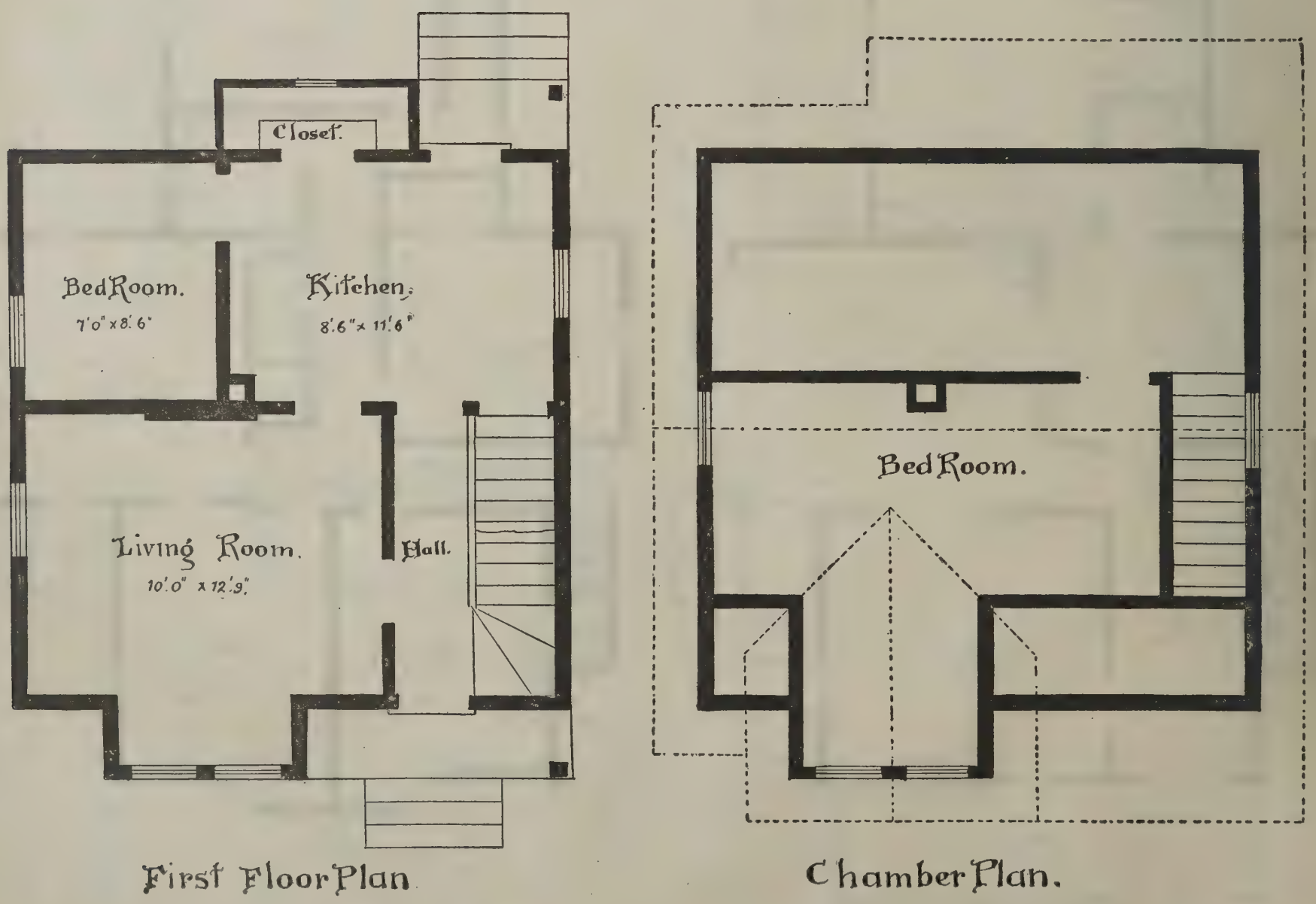
Maple Flooring.

"Maple flooring," the New York gentleman remarked, "does not receive the attention in our market that it deserves. The architects are decidedly hard headed. Of all men, they should be progressive and up to the times, but they linger by the way in a provoking manner. They have been used to yellow pine flooring, and yellow pine flooring it must be to the end of the law. Now as between the two kinds of flooring, maple and yellow pine, I consider maple much superior in most cases. Especially when trucks are run over the floor, or it is otherwise subject to heavy work, maple leads so far that yellow pine is nowhere. Keep a maple floor damp, and the heavier the business done on it, the harder the boards become. The wear there is in it is simply astonishing. The architects, however, seem to care little for that. They go on, on, in the same old rut. If the use of maple for flooring were an experiment, there might be some excuse for this pigheadedness, but it is no experiment. It has been tried and not found wanting in a single respect."—*Northwestern Lumberman.*





A THREE THOUSAND DOLLAR RESIDENCE.



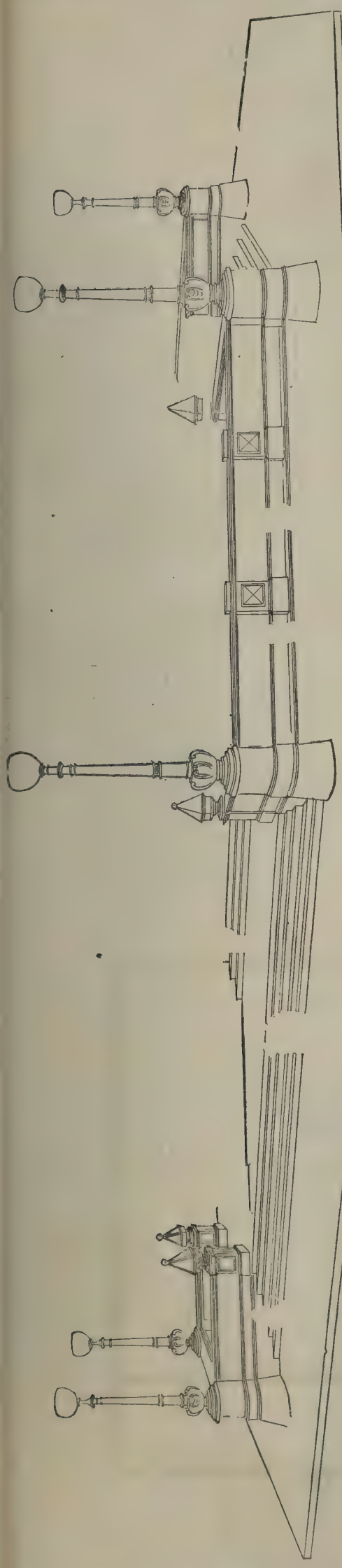
A ONE THOUSAND DOLLAR COTTAGE.

[For description see page 91.]

A MONUMENT TO THE MEMORY OF GENERAL GRANT.

DESIGNED AND DRAWN BY JOSEPH A. STARK, ARCHITECT, 12 CHAMBERS STREET, N. Y.

The illustrations show a composition of a truly monumental character. The proportions of the structure are very fine, and work up to an impressive whole The design is a symmetrical one, and the perspective view is equally effective from all sides. At the same time, the



MONUMENT TO GEN. GRANT.—DESIGNED BY JOSEPH A. STARK, ARCHITECT, NEW YORK.

actual dimensions are not excessive, and the cost is such that the entire work, including all statuary and sculptured relief work, can be carried out in a perfect manner for the sum of $250,000. This sum would cover the employment of choice materials throughout; of rich and rare marbles for the columns, pedestals, and interior wainscoting of the pavilion and crypt. Ten pieces of bronze statuary are included, of one and one-half life size; also four bass-relief battle pieces for the pedestal of General Grant, and eight medallion heads of leading men famous in the history of the war. These are intended for the four main pillars of the pavilion and crypt.

The general material of the structure is intended to be a warm-colored limestone; steps and terrace paving of marble tiles. Candelabra, pedestal ornaments, arch spandrel pieces, and the winding laurel leaf ornament around the four columns are intended for bronze.

The pyramidal dome is of stone, richly ornamented with a bronze gutter, and apex for the crowning figure, "Union Triumphant." The domed ceiling of the pavilion is intended of segmental section, treated with marble mosaic. The arcaded frieze is specially introduced in the design to light up this ceiling. It is no mere ornament.

The idea of the design is, withal, a very simple one. It is this simplicity and directness of the thought which is the secret of the dignified grace and grandeur of this composition.

It is a monument of glorification to a man, and it is also his tomb. The statue of the General stands on an appropriate pedestal in the center of a square pavilion. The pavilion is raised above the ground on a terrace of ornamental outline, to which steps lead from three sides. The terrace is about 80 feet square. The pavilion is 25 feet square. It is pierced on its four sides by circular arches, 15 feet span and 25 feet high. Above the arches is the arcaded frieze to light up the domed pavilion ceiling. The four corners of the pavilion are ornamented and emphasized by rich detached columns on pedestals, from which large reclining scrolls descend. These finish with a pedestal, on which is placed an appropriate statue. These four statues might be Victory, Defeat, Peace, and War. The object of the scrolls is to give architectural base and emphasis to the pavilion, and also to connect closely with the monument proper all the other sculptural works. The columns are crowned by a cornice and pedestals on which are placed statuary groups representing the four arms, infantry, cavalry, artillery, and the navy. The pavilion is roofed with a pyramid in stone, richly designed and finished with a crowned figure, "Union Triumphant." The total height of the monument from the ground level to top of apex statue is about 70 feet.

The style of design is severe modern Renaissance, richly treated, which is the only style of architecture appropriate.

Under the monument the crypt is arranged. It is reached by stone stairs, where shown on the plans. The crypt is a square vaulted chamber, with the sarcophagus in the center. It has four circular niches to give additional space for placing trophies and mementoes of the war, and for visitors' seats. The crypt is intended to be lined with choice marbles, and to have a mosaic vaulted ceiling. Provision is made for daylight to enter through the ceiling.

Here is a monument of meritorious design, of adequate dimensions, and of rich and tasteful treatment in its architectural and sculptural features.

In its radiance of marble, bronze, and gold, it would be a worthy tribute to our great hero. The structure can be erected complete in an opulent style for the sum of $250,000.

This does not say that General Grant does not deserve a million monuments. It simply says that a million is not necessary to produce a monument worthy the man and the occasion. It is difficult to see how even a million dollars will produce something more truly monumental, appropriate, or complete.

The author of the design, Mr. Joseph A. Stark, architect, of No. 12 Chambers Street, N. Y., will be pleased to show the original drawings and give any further desired information.

Shingles in Modern Architecture.

Those who have watched the tendency, or, we may say, the evolution, of style in wooden suburban and country houses, must have noticed the gradual disappearance of the monotonous and uninteresting clapboard, with its uncompromising horizontal lines.

The cry is, "The clapboard must go," and it is going. But what is replacing it? The answer is instantaneous—the shingle. With the many ingenious methods of laying shingles, the greatest variety of effect can be obtained without cutting them at all.

But now comes the important question of coloring. At first paint was used, but the dull monotony of masses of color covering the grain of the wood has now almost universally given way before the modern creosote stains. Many attempts have been made to imitate the effect of stains without using creosote, but they have been sad failures, as other oils do not penetrate the wood and bring out the grain in relief. A test was recently made at the request of well known architects of Boston, by a prominent chemist, of all the materials sold under the name of "stains." The result was that he pronounced "Cabot's Creosote Stains" among the best of them all.

These creosote stains have already been so long in use that the preserving properties of the creosote have begun to show their value on houses in all parts of the United States.

There are no more picturesque houses in New England than many of the shingled villas and cottages of recent date, and we cannot avoid the conviction that much of their beautiful harmony of color with design is due to the almost universal use of the stains above mentioned.

CANNON'S DIAMOND POINT NAIL SET.

The accompanying illustration shows an ordinary nail set, the efficiency of which has been vastly increased by a specially hardened diamond-shaped point or tit formed on its end. It is evident that the slightest blow of the hammer will cause this point to catch in the head of the nail, and thereby prevent the set from slipping. This will save in many cases valuable pieces of work from injury, as the set will surely follow a nail through any piece of stuff without slipping off. These sets are made from the best quality tool steel; the points are thoroughly tempered, and will not break off. This essential improvement is manufactured by the Edward Storm Spring Company (Limited), of Poughkeepsie, N. Y., to whom all communications should be addressed.

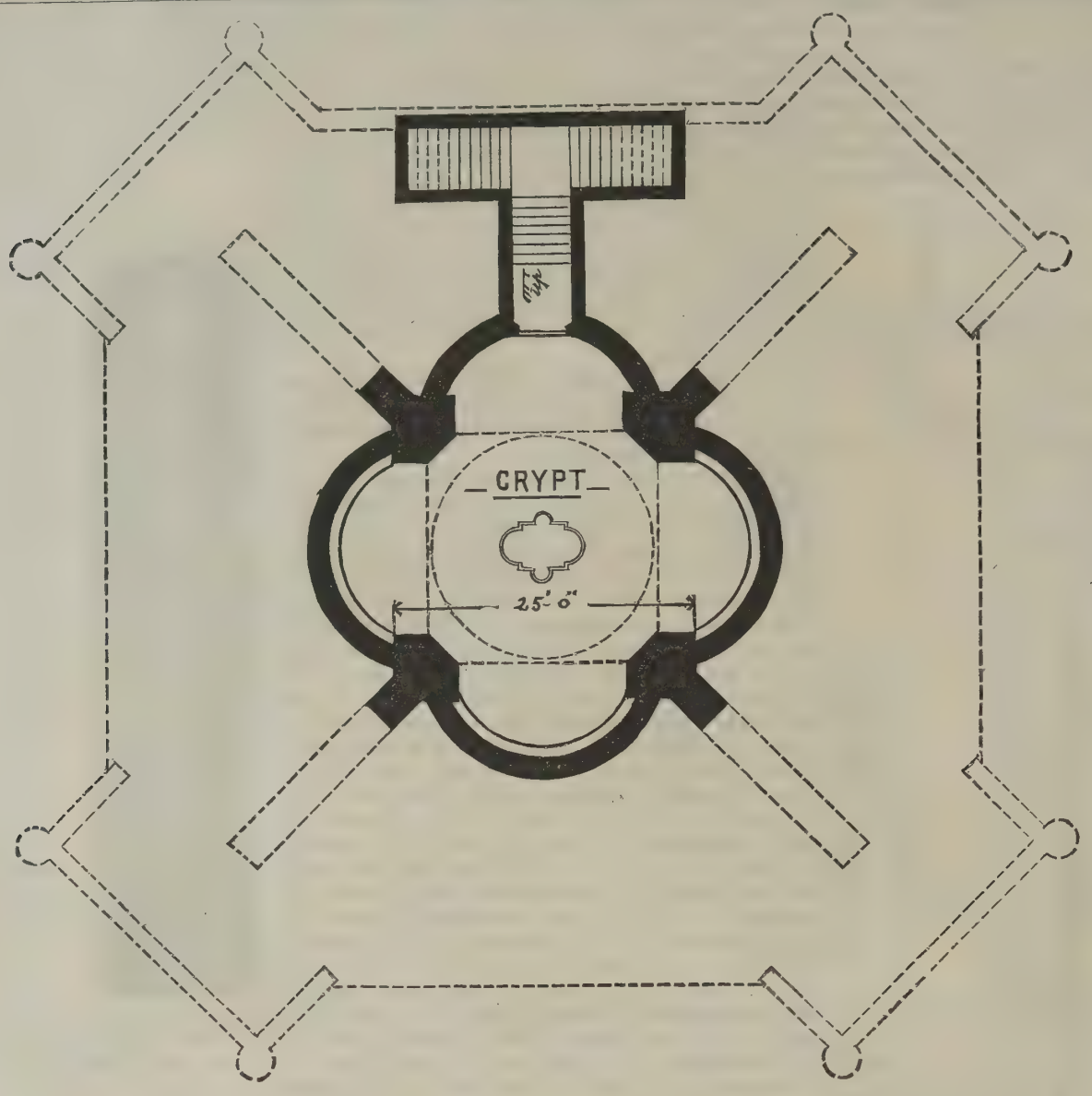
ADJUSTABLE WOOD MEASURING RACK.

By means of this device, wood may be measured by the cord or fractional parts of a cord, as occasion may require. The sill frame consists of two longitudinally ranging timbers, connected by cross bars. Near one end of the timbers are fixed uprights, braced to each other and to the timbers. To the inner faces of the sills are screwed a series of headed pins, the first one being exactly one foot from the inner face of the end posts, and the others being spaced one foot apart. Two posts, braced together by rods, are adapted to stand on the sills, and to the inside face of each post is attached, by coach screws, a metal plate provided with a hook at its lower end, adapted to engage with the shank of one of the headed screw pins of the sills. Attached to such post is a brace with two arms, and formed at its lower end with a notch to engage the pins on the sills. The metal plates and braces are slotted for the passage of the screws, so that the movable frame may be quickly and easily set perfectly plumb, whichever opposite pair of the sill pins may be engaged by the hooked plates. The posts are exactly four feet high, and one is marked by cross lines one foot apart. It is apparent that, to measure a cord, the frame is moved to the eighth set of pins and the wood is piled to the tops of the posts. To measure half a cord, the hooks are engaged with the fourth pins. By adjusting the hooks to the first pair of pins, and filling the wood in between the end posts up to the first cross line on the post, a single foot of wood can be measured, or up to the second line for two feet, and so on. Thus a cord or any fractional part can be readily measured. To disengage the frame, it is only necessary to tilt it forward toward the fixed posts, when it may be shifted to any point along the sill frame.

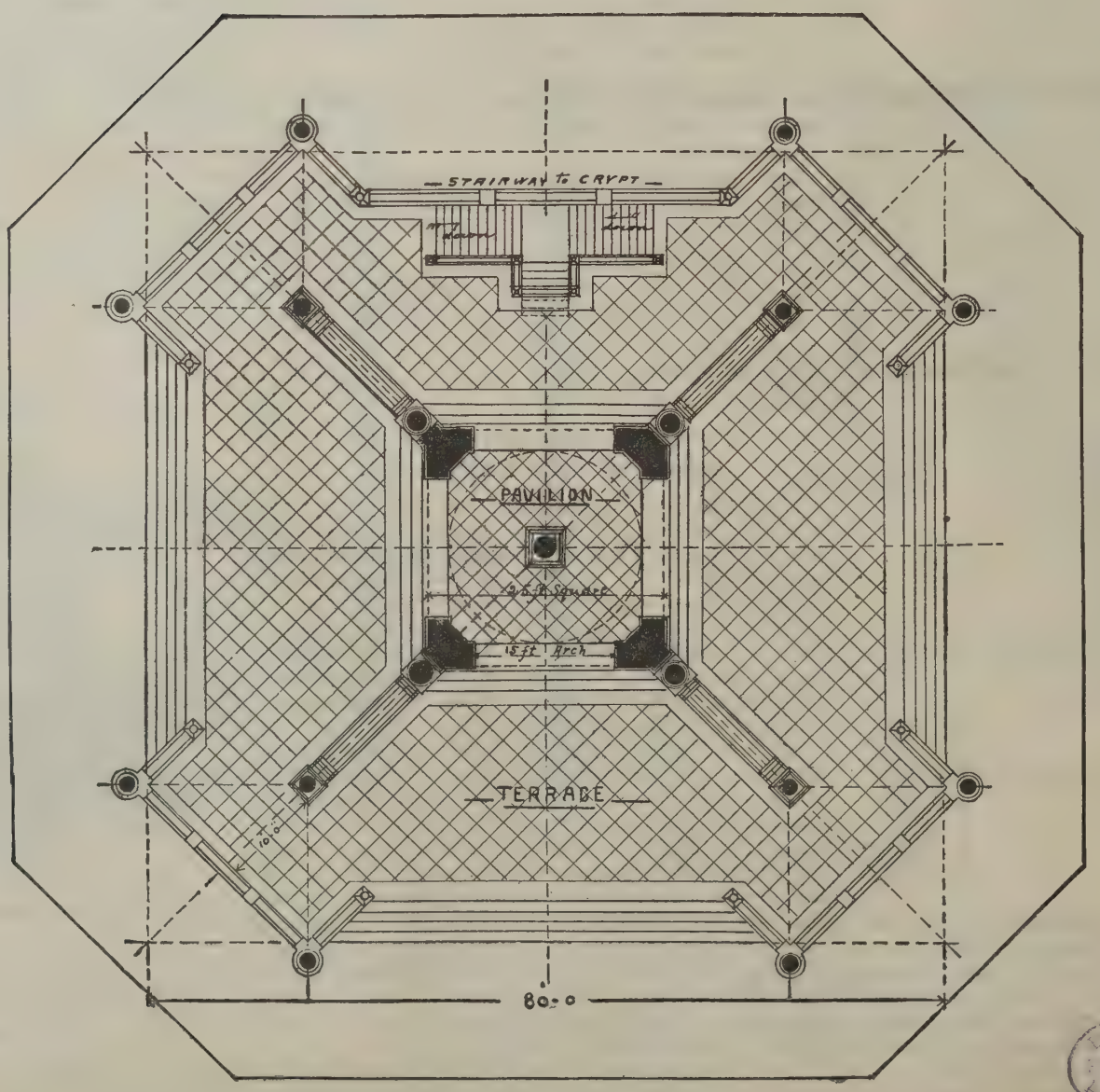
BROUGHTON'S ADJUSTABLE WOOD MEASURING RACK.

This invention has been patented by Mr. Horace L. Broughton, whose address is P. O. box 320, Marblehead, Mass.

THE German colliery owners are about to prohibit blasting with black powder in fiery mines; also the use of naked lights in every part of the workings, as well as a mixed system of safety lamps.

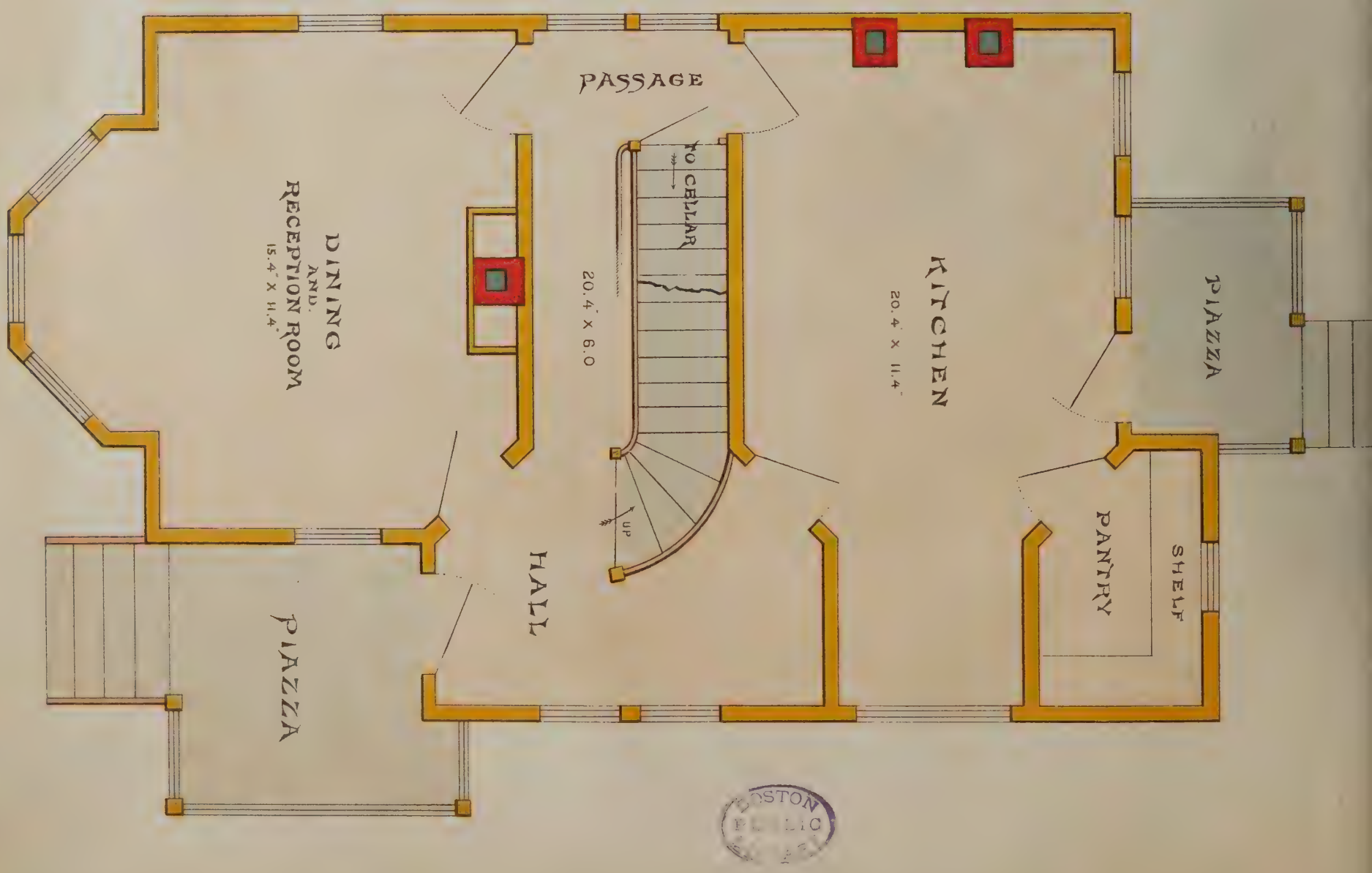


PLAN OF CRYPT AND OF FOUNDATIONS

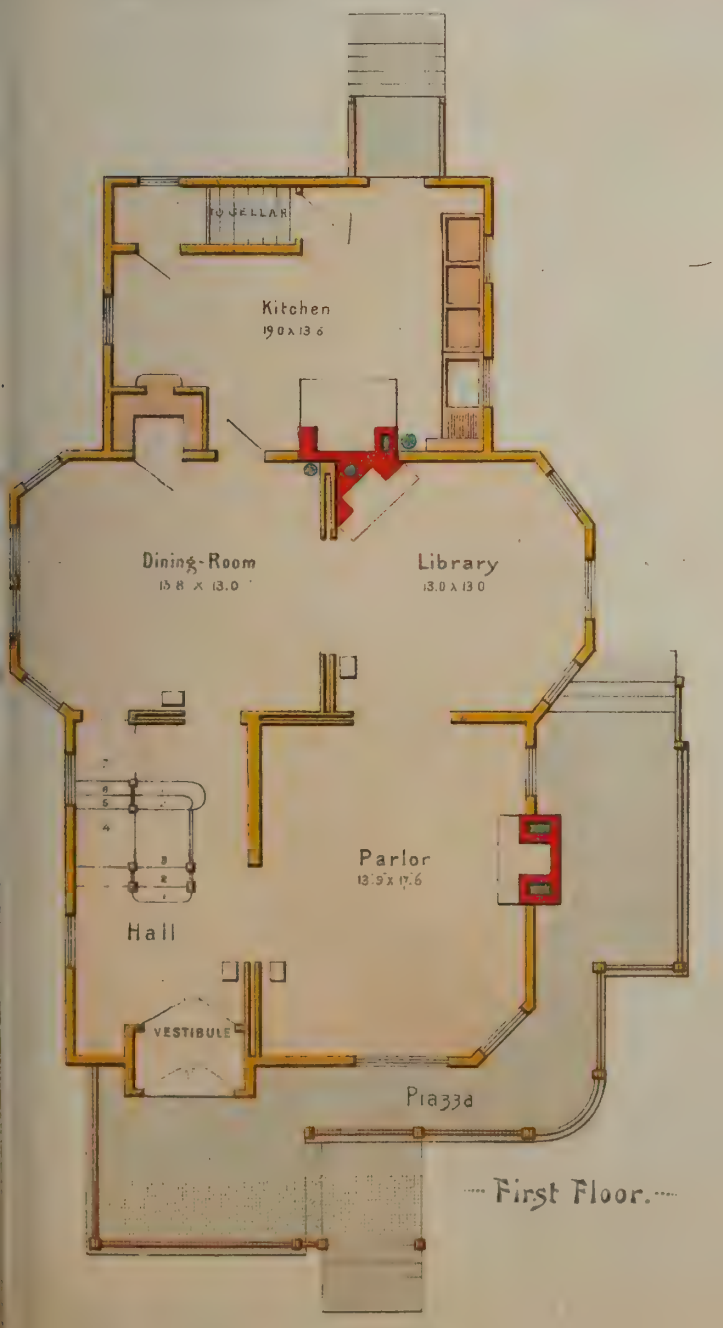


PLAN OF MONUMENT.

A COTTAGE OF MODERATE COST INTENDED FOR FUTURE ENLARGEMENT.

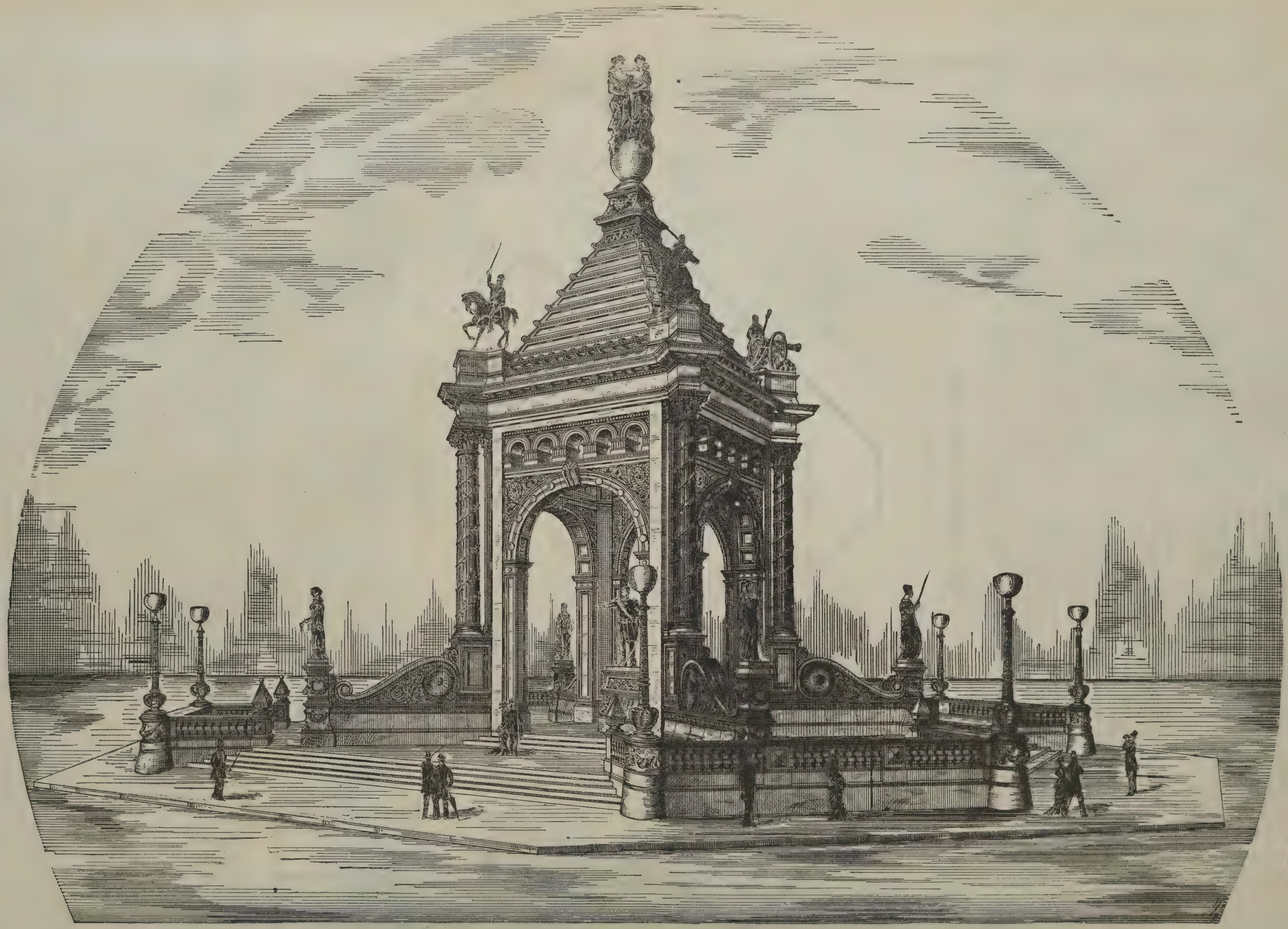


RESIDENCE OF F.W. COOLBAUGH, ESQ. EAST ORANGE N.J. GEORGE COOKE, ARCHITECT.



First Floor.

Second Floor.



DESIGNED AND DRAWN BY JOSEPH A STARK ARCHITECT, 12 CHAMBERS ST. N.Y.

PICTURESQUE SUMMER HOTEL.

The illustrations presented in this issue for a suburban hotel, by Mr. Geo. Edw. Harding, architect, No. 40 Exchange Place, N. Y., exhibit a novel departure from the hitherto stereotyped lines of similar structures.

Its strong, salient angle, accentuated by the prominent tower and chimney, with its receding wings, artistically broken by the square stone tower and twin gables, combines effective architectural grouping with a simple style of treatment which pleases by its varying outline of plan and sky lines.

The first story and square tower throughout is constructed of random rubble masonry, while the upper portion is sheathed with creosote-stained shingles, cut to patterns, and roofed with hand-split oak shingles, laid "in and out," of natural color, giving a most picturesque appearance without apparent effort.

In the plans it will be noticed that the executive offices, while convenient for guests, are still central for commanding the various dependent departments and their general service.

The music room, grand parlor, and dining room are *en suite*, which affords opportunity for evening dances, amateur theatricals, or concerts, with the verandas in convenient proximity. The feature of an open loggia for dining in pleasant weather, with a band piazza above, is novel, and, we should think, a delightful arrangement for its patrons.

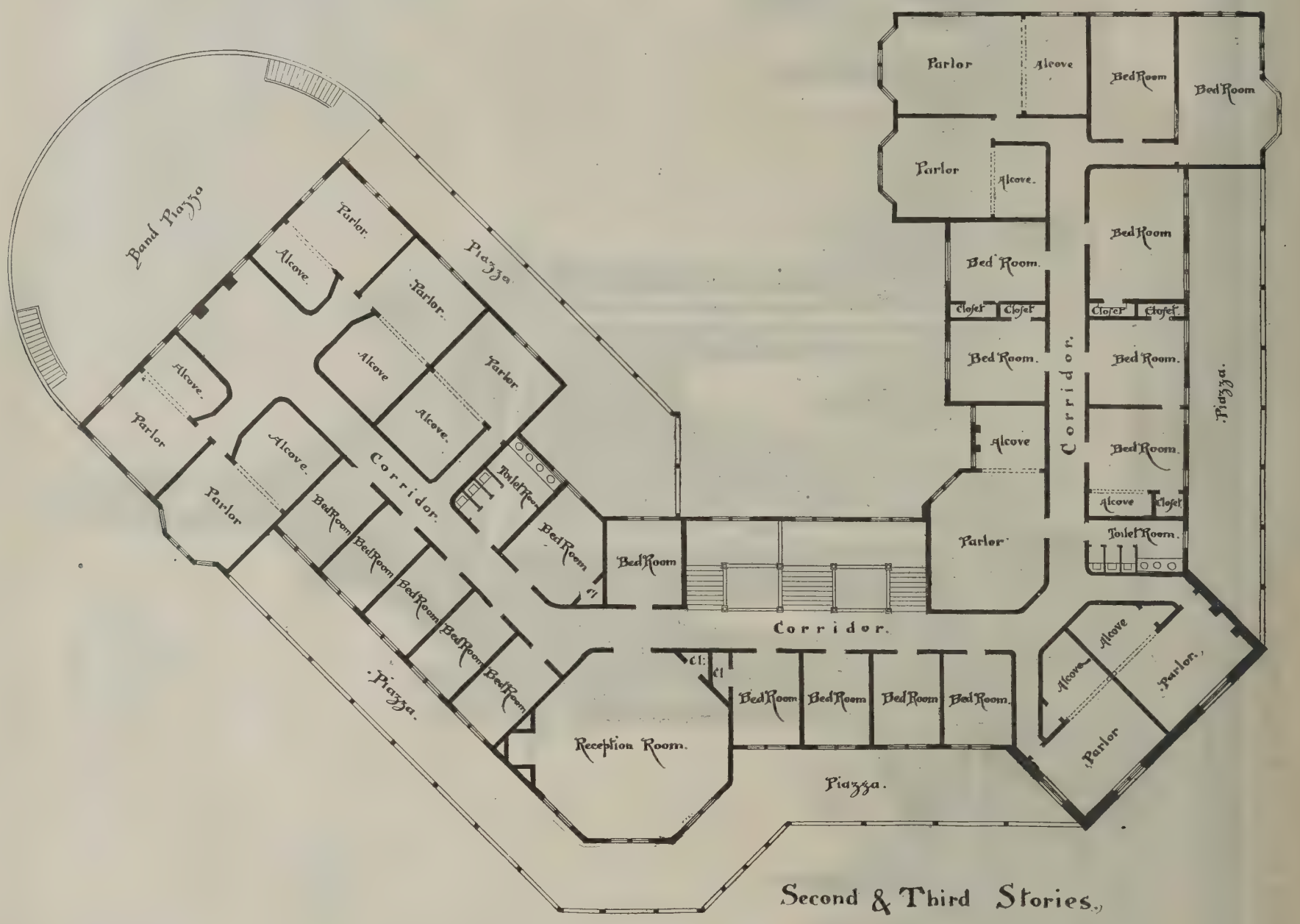
The chambers and corridors are superior in their resulting light and ventilation, while success is assured by the peculiar plan of arrangement, which strongly commends itself for sites where the land or water scape affords interesting views from varying points.

The floors are of comb-grained Georgia pine, and the trim is of stained ash and natural cherry, no painting being allowed inside or out.

The plaster is cathedral finish, the mortar being also stained by blending the desired colors when mixing in the bed. The mantels are of buff terra cotta, moulded in flat relief, with brick linings of similar tone.

Peculiar features in the culinary department are an old fashioned brick oven, such as our forefathers were accustomed to have their baking done in, and an open, wide grate, 7 ft. long by 2½ ft. high, in front of which all the roasted fowls are revolved by a "turnspit," operated by a smoke jack in the flue above, which would seem to prove that some of the old methods of cooking deserve imitation even in the present days of French cooks.

The present design is about being erected in the vicinity of this city, at a cost of $48,000.



DESIGN FOR A SUMMER HOTEL.

The Use of Mortar During Frost.

Some time ago the police authorities of Berlin issued an order forbidding the construction of brickwork should the temperature fall to or below 2 degrees R. (26 degrees Fahrenheit). This order being based on the supposition that mortar freezes at that temperature, and does not set, Herr Krause, architect, of Stropp, sent a communication to the *Baugewerke-Zeitung*, in which he publishes his experiences, which by no means seem to bear out the necessity for issuing the order. We give a *resume* of Herr Krause's remarks, as well as of the opinions of some other German architects upon the matter. Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very heavy, sharp frost, the temperature being down to from 4 degrees to 8 degrees R. (23 degrees to 14 degrees Fahrenheit). As bricks and sand were frozen, his workmen had great trouble in properly setting the bricks, the mortar freezing under their hands. It would have been too expensive to warm all the materials previously. He, therefore, had the lime slaked in small quantities, mixed the mortar hot, and had the brickwork liberally pointed. He fully expected to find the mortar perished in the spring. But he was greatly mistaken, for the work was as firm as if it had stood for several years. In 1880 he had to take the same building down, when the mortar was found so firm that the bricks broke and could be cleaned only with difficulty. Herr Krause subsequently had other pointing done at several degrees of frost, and always found that, if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. The architect in question says that, if it freezes, and the frost continues for some time, it is much firmer than when applied in the height of the summer. It is different when a sudden thaw sets in after a sharp frost.

Herr Krause had executed, during an alteration, a wall ten meters high and three meters wide, with three windows placed over each other, and joined to an old brick wall, when suddenly a thaw set in. The wall settled about six centimeters, and bulged out, so that he had great trouble in preventing it from collapsing. A sudden frost, however, made it firm again. After twenty years the wall is as good as ever, and there are no cracks. In that case, however, he had omitted to use unslaked lime, employing only hot water. The bricks had been stored in a heated room. Herr Krause has come to the conclusion that continued frost had the contrary effect upon mortar to what is generally supposed.

Herr A. Klemm, architect, of Stuttgart, expresses the same opinion in a communication which he sends to the *Deutsche Bauzeitung*, in which he says that in the winter of 1848–49 the works required for altering and fitting up the Prussian House of Deputies had to be carried out during a most severe frost. Notwithstanding this fact, the brickwork, executed with freshly slaked hydraulic lime, was found to be so firm in 1867, when alterations had to be made, that in some portions wedges had to be used in breaking it up. Herr Klemm adds that in his country (Wurtemberg) it is the general opinion that frost not only does not injure the brickwork, nor the plastering, but it improves its quality. The frost, however, should continue for some time. Herr Klemm expresses surprise that doubts could be entertained on the subject.

A Berlin firm of builders, Herren Ende & Bockmann, writing on the same subject to the *Deutsche Bauzeitung*, state that, in the autumn of 1864, they had orders to erect a warehouse, near Unter den Linden, during the winter. They were at first indisposed to undertake such work in that season; but circumstances demanded speed, and building operations were continued during the frost. They fully expected to find the brickwork faulty in places when the spring came, and had made up their minds that they would have to replace some of it. They were agreeably surprised to find the brickwork perfectly sound; in fact, it seemed to have set exceptionally well. Since that time the above Berlin firm of builders have not hesitated to continue bricklayer's work as long as they could; that is to say, as long as the water did not freeze on the bricks or the mortar in the pans. It should be added that the lime mortar used at Berlin is said to be of exceptionally good quality.—*The Builder.*

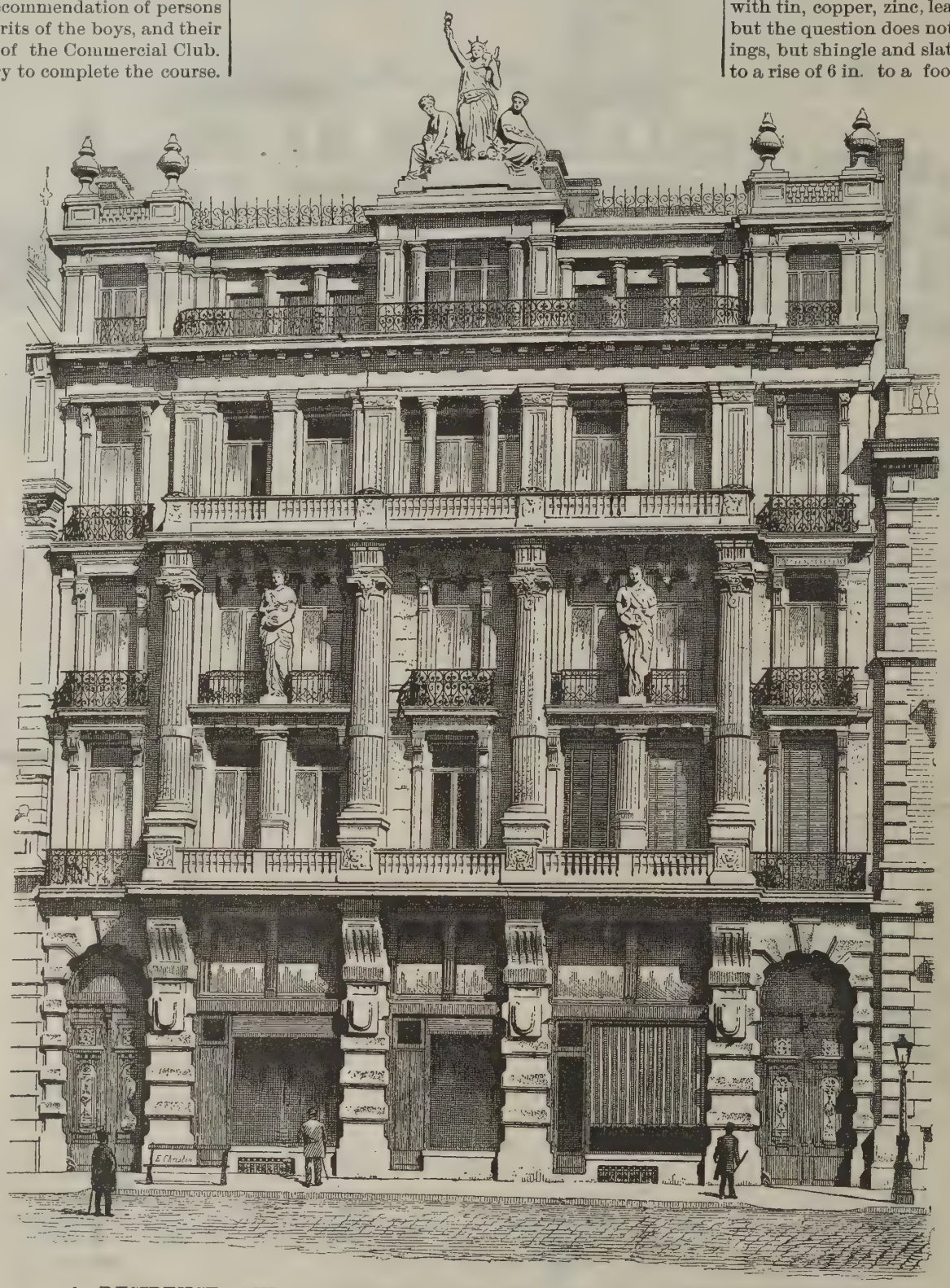
To Bleach Oils.

To bleach oils, 1 lb. permanganate of potash is dissolved in 3 gals. water, and to the deep violet solution 30 lb. of the oil to be bleached are gradually added, and the mass thoroughly stirred as often as possible during the next 48 hours. Then 2 gals. water and 5 lb. ordinary hydrochloric acid of about 19–21° Be. are added and incorporated with the mass by energetic stirring, whereupon it is left to stand for several days, when the sour water is siphoned off, and the remaining oil carefully washed with several hot waters, until every trace of acid is removed; finally, it is filtered through charcoal. Besides olive oil, linseed, poppy, palm, and fish oils may be treated in this way.

DESIGN FOR A SUMMER HOTEL.—GEORGE E. HARDING, ARCHITECT, NEW YORK.

A BUSINESS HOUSE AND RESIDENCE.

Brussels has long been regarded as one of the most beautiful cities of Europe. Her public edifices are grand and imposing, betokening the influence of an elevated architectural standard, the influence of which is also seen in many a private structure. We give an example of a recently erected combined business house and private residence, on the Boulevard Anspach, which is worthy of notice for its substantial as well as ornate character. Our engraving is from a drawing by von J. Engelhorn in *Architektonische Rundschau.*



A RESIDENCE AND BUSINESS HOUSE, BOULEVARD ANSPACH, BRUSSELS.

The Chicago Manual Training School.

The Manual Training School is not conducted on a free principle. A tuition fee is charged for each student. With the exception of twenty pupils admitted this year, the fee is paid individually. These twenty were received upon recommendation of persons competent to judge of the merits of the boys, and their tuition is paid by members of the Commercial Club. Three years' study is necessary to complete the course. Of the seventy-two who entered the first junior class, twenty-seven remained to graduate. Ninety-eight entered the junior class last September. Four of this number have since dropped out. The boys who enter are from the ages of 14 to 15. None under 14 is admitted. No candidates are accepted who cannot pass a satisfactory examination in reading, writing, spelling, geography, English composition, and arithmetic. A boy must have, too, a certificate of good moral character from some responsible person. The penalty of any impropriety in conduct is dismissal. Latin, French, descriptive geometry, and higher algebra are taught. The first manual work a boy does when he begins the course is in the wood room. There he learns various branches of the carpenter's trade, joinery, wood turning, and pattern making. He learns not only the use of tools, but their proper care. Each boy furnishes his own kit and has his own tool drawer. Extra tools are supplied if needed, but the student is made responsible for them. Recently the boys were at work on picture frames, tables, hammer handles, and the wood parts of other tools. In the second year the pupil is put in the foundry and blacksmith shop. No better hammers and screw drivers can be found in Chicago than are made by the lads. The most expert workman can turn out no smoother pieces of casting than some they show. In the senior year the students get into the machine shop. By that time they are able to make and put together a steam engine. Three were constructed in the school last year, and three will be made this.

The work of making an engine begins in the drawing room. Every stroke of the pencil is made by actual measurement, even to the drawing of a bolt head. The scholars draw the plans for the patterns, and then make the patterns. In the machine shop the busts of Stephenson, the engineer, and James Watt, begrimed with the soot of labor, look down upon the busy workers. The boys will soon try their skill in constructing an ornamental iron gate for the Michigan Avenue entrance of the building, for which drawings are now being made in the school.

The wood room contains thirty-nine cabinet makers' benches, twenty-four speed lathes, a circular saw, scroll saw, a boring machine, planer, grindstone, shoot plane, bench lathe, and general tools sufficient for the use of ninety-six boys. In the foundry are two furnaces, crucibles, troughs, flasks, trowels, rammers, sieves, and other apparatus, so that sixty-six boys can work at once. In the forge room they can get smut on their faces together, too, at the same time. There are twenty-four forges, twenty-three anvils, one emery wheel, one shears, three vises, one blower, two exhaust fans, tongs, sledges, hammers, fullers, and all the other tools required to transform clean skinned youths into the sootiest of blacksmiths.

The machine shop has seven 12 inch, 6 foot bed engine lathes. There is also an engine lathe with a 16 inch swing and 8 foot bed. There are two speed lathes, a planer with 6 foot bed, shaper, drill, grindstone, fifteen benches, fifteen vises, chucks, boring bars, taps, dies, chisels, files, and other tools—enough for thirty-two amateur machinists.

A visitor can pass through every room in the building and find no idlers. All are absorbed in the work they have in hand, and scarcely raise their eyes. "The fact that their attention is so riveted on what they are doing," said Mr. Belfield, "shows the cultivation of a most important faculty of the mind—the power of concentration. This attention, too, is not enforced, but is voluntary and unremitting. The boy who goes through a three years' course here not only attains intellectual development, but he gains comprehension of essential branches of knowledge far superior to those of the high school pupil. The training school is by no means a manufacturing establishment. The product of the school is not intended to be perfect pieces of machinery and polished furniture, but polished, perfect boys. It practically demonstrates, also, the dignity of labor. So thorough is the training here, that graduates who desire to pursue a higher grade of education are admitted, on recommendation of the director, without examination and free of conditions to several of the colleges and universities of mechanics and engineering in the United States.

"Prof. R. H. Thurston of Sibley College, Cornell University, wrote to me recently that if we could send him as good specimens of boy development as we have already forwarded, they'd be glad to get them. The professor of mechanical engineering at Perdue University, Lafayette, Ind., also wrote to me about one of our graduates who is there: 'If you can send us any more boys like this one,' he says, 'we shall be mighty glad to get them.' I believe we have struck the key note for the practical education of boys in the system of the Manual Training School. It embodies at once the education of the hand to skill and the brain to directive intelligence. There come the boys down to lunch. Their dining room is in the basement. They have made all the tables themselves."

Water-Tight Roofs.

The question is often asked, What is the proper pitch for a roof to shed water and snow? In discussing the question we need only go into the merits of the case so far as it relates to a condition of flatness or it approaches a level. Generally builders claim that less than what is known as a fifth pitch cannot be successfully shingled or slated with any guarantee of safety. As is well known, any pitch or incline may be covered with tin, copper, zinc, lead, or iron, and be made tight, but the question does not affect the use of metal coverings, but shingle and slate. One-quarter pitch is equal to a rise of 6 in. to a foot run, and one-fifth pitch is equal to 4⅞ in. rise to one foot run. The first may be considered entirely safe for slate, and the second for shingle. Upon a comparison of a large number of roofs in different parts of the globe, a roof of one-quarter pitch is the correct one for the climate of the Western and Northwestern States. From the fact that slate cannot be as closely nailed as shingle, for fear of breakage, the joints are left more or less open, and therefore they must be laid steeper than shingle. A good rule to be observed in laying a shingle roof is to give the rafters a sufficient pitch, so that the butt of a shingle will be at least 6 in. below the thin edge. By experiment it will be observed that in a quarter pitch roof the butt is 7¼ in. below the thin edge for a standard 16 in. shingle, and 6 in. in a one-fifth pitch. The same rule may be observed in a slate roof, only the pitch, as we have said, should be not less than quarter.

The *pitch* is the distance across the building from eaves to eaves, divided into as many parts as desired; when divided into four parts, the roof is termed ¼ pitch, as the height from the level of the eaves to the apex of the roof should be equal to ¼ of the distance from eaves to eaves. The manner of obtaining ⅛ pitch is the same, except the subdivision should be in five equal parts.

The cause of leaky flat shingle roofs is the backing up of the rain or moisture beyond the thin edge of the shingle, under the butts of the next uppermost; that is, supposing that the shingles are well laid, lapped and nailed. Another feature connected with flat or comparatively flat shingle roofs must be considered, and that is, the inability of the shingle on account of its flatness to quickly shed rain and moisture and to become dry within a reasonably short period of time. This state of continuous dampness, except when directly affected by the sun's rays, generates seeds of dry rot that eventually sap the life of the wood and soon end the usefulness and substantiality of the shingle.—*Hill's Builder.*

Old Iron.

A most remarkable feature in trade just now is the large export of old iron to the United States. In January, two years ago, we sent 856 tons of old iron to the United States; in January, last year, we sent 3,271 tons; but last month we sent 21,667 tons of old iron to the United States. This enormous increase in the export of "scrap" iron means much; it means that the United States is using all its own and has to buy large additional quantities, and it indicates the fact that the users of iron here will have to use more pig iron in place of the scrap.—*Newcastle Chronicle.*

AN ENGLISH HOME.

We give an elevation from the *Building News* of a house at West Wickham, built chiefly of brick, and at an estimated cost of ten thousand dollars. There are several features in this elevation that may prove interesting and suggestive to those who are looking for house plans.

A ONE THOUSAND DOLLAR COTTAGE.

DESIGNED BY B. J. SCHWEITZER, ARCHITECT.

SPECIFICATION.

MASON WORK.

Cellar.—To be excavated under the entire house, 3 feet deep. Build a stone wall, 18 in. thick, up to the surface level, laid in good mortar. Above the surface build an 8 in. hard brick wall, 3 ft. 6 in. high, all laid in good mortar. Point up the stone and brick walls and leave complete for the frame.

Piers.—Build three brick piers in the cellar to support the girders. Also build piers of brick for the front and rear stoops.

Chimneys.—Build an 8 in. flue chimney, of hard bricks, laid in good mortar, as indicated on plan. Thoroughly strike all joints with cement complete. Top out the chimney as shown, and finish it with an iron cap. Provide all rooms with stove pipe holes and thimbles.

Lathing and Plastering.—Lath all walls and ceilings on first floor with spruce lath, and plaster two good coats of mortar and hard finish complete.

Privy.—Build vault as required.

CARPENTER WORK.

From front to rear, put in girders 4 in. × 8 in. of hemlock; sills, 4 in. × 6 in., halved at all angles; corner posts, 4 in. × 6 in., 13 ft. long; interties, 4 in. × 6 in., mortised into corner posts; plate, 4 in. × 4 in.; first and second floor beams, 2 in. × 8 in., placed 16 in. from centers; rafters, 2 in. × 6 in., placed 20 in. from centers; wall strips, 2 in. × 4 in., placed 16 in. from centers; sills for stoop, 3 in. × 4 in., and beams 3 in. × 4 in. All timber to be of the best quality hemlock. Bridge the floors and spike together the entire frame.

Sheathing.—Cover the house from sill to plate with hemlock boards, well nailed.

Paper.—Over the rough boards put on resin sized sheathing paper, and lap all joints.

Siding.—Cover the house from sill to plate with narrow lap siding, free from bad knots and sap.

Outside Trim, all of White Pine.—Water table, 1¼ in. rabbeted; corner boards, 1¼ × 5 in, with angle beads; bands, 1¼ in. × 6 in., rabbeted; cornice, 7 in.; moulded verge boards, 1¼ in. × 8 in. chamfered. Bay trim, 1¼ in. stuff, panels sunk with flush mouldings. Shingle the gables with regular 6 in. sawed white pine shingles, 6 in. to the weather. Shingle all the roofs with merchantable white pine shingles, laid 5½ in. to the weather over shingle lath.

Gutters.—Build ample troughs at the eaves, and tin them with best I. C. tin.

Stoop.—Posts 6 in. chamfered, cross pieces same, floors covered with 1¼ in. white pine, with white lead in the grooves. Steps are as shown, of best white pine, risers ⅞ in. and treads 1¼ in.

Leaders.—Provide 3 in. leaders for the house from the gutters to the ground.

Windows.—All sash 1½ in. thick, glazed with good American sheet glass. The large panes are to be double thick. Furnish all with the "Ives" sash fasteners, and furnish all with pulleys, weights, and cord.

Blinds.—All windows are to have outside blinds 1¼ in thick, hung on N. Y. wrought iron hinges in pairs, and all are to have fasteners.

Doors.—Outside doors 1¾ in. flush moulded panels, and transom over the top. Furnish with heavy mortise lock, black knob and good furniture. All other doors, except closet doors, 1½ in. thick, four paneled, flush moulded. All closet doors 1¼ in., four paneled. Furnish all 1½ in. doors with mortise locks, and all 1¼ in. doors with rim locks. All are to be hung on loose joint butts. Saddles are to be of hardwood, jambs ⅞ in. with stop beads. All doors are to be of best white pine.

Floors.—Cover all floors with 4½ in. × ⅞ in. white pine flooring, in usual manner.

Inside.—Trim all plain with turned corner block. Windows to have stools and aprons. Base, 6 in., beveled top and beaded sides. All of good white pine.

Closet.—Provide the kitchen closet with five rows of shelves.

Stairs.—All as per plan, risers ⅞ in., strings 1¼ in., and treads 1¼ in., all good white pine, thoroughly wedged and glued together in the best manner.

Mantel Shelf and Brackets.—The parlor or living room is to have a neat 1¼ in. beaded shelf, supported on neat wooden brackets with beaded face. All not to cost more than $3 complete.

Privy.—Size to be 4 ft 6 in. × 4 ft. 6 in., built in same manner as house. Provide seats, stench pipe, and cleaning trap, also door and small window, all complete.

Painting.—Paint all metal work with Brandon metallic paint, two coats. Paint all outside woodwork, except shingles on roof, two best coats of white lead in L. I. oil. Paint or stain the inside, and varnish with best No. 2 "Elastica" finishes all complete, two coats.

Finally.—The entire work must be completed in a faithful and workmanlike manner. All materials to be of good merchantable quality.

A LAND slide in the mountains above Chico, Cal., the other day laid bare broad streaks of white quartz which carries, apparently, a very large percentage of gold.

A Quick Lawn.

Mr. William Saunders, of the department of agriculture, at Washington, recommends timothy for making a quick growing green covering for a lawn.

As is well known, the finer grasses, like June grass, *poa pratenses*, and fine bent grass, *agrostis vulgaris*, are very slow in making a firm, thick sod, and are often badly held back while young by rank growing weeds. Some who want a green covering for newly made lawns as early as possible sow some oats or millet, keeping them closely cut the first summer, but these grasses, though better than nothing, and better than weeds, are too coarse and quite unlike an ideal lawn grass. Timothy, while not fit for a permanent lawn grass, is quick to grow and of good color the first year, and makes a far better appearance than the coarser grains, like oats or millet. It dies in a few years from the close clipping it gets, leaving the lawn in possession of its permanent occupants.—*N. E Farmer.*

THE CATHEDRAL, MEXICO.

In the city of Mexico, all the main thoroughfares converge on the great Plaza de Armas, or Main Square. Most of the public buildings are here located. On the north side of the square stands the magnificent cathedral, which occupies the ancient site of the heathen Aztec temple or pyramid. The cathedral was begun in 1573, and completed by the Spaniards in 1657, at an immense cost, the expense of the walls alone being two millions of dollars. The building is in the form of a Greek cross, 426 ft. long and 203 ft. wide, with two naves and three aisles, twenty side chapels, and a magnificent altar supported by marble columns and surrounded by a tumbago ovallos balustrade, with sixty-two statues of the same, composed of rich gold, silver, and copper alloy, serving as candelabra. There is an elaborately carved chair, also inclosed by tumbago railings, weighing twenty-six tons, and valued at one million five hundred thousand dollars. The Doric style prevails in the interior. Renaissance on the exterior, which is adorned by a fine dome and two open towers 218 ft. high. Our engraving, from *La Ilustracion Espanola*, presents an interior view of the great nave, and gives an idea of the magnificent architecture of this remarkable edifice.

AN ENGLISH COUNTRY HOUSE.

A NEW vermin exterminator is prepared by saturating wheat or other grain with a solution of strychnia in water, the grain afterward being coated with a solution of simple sirup and arsenic, a small quantity of oil of rhodium being afterward applied. It is doubtful whether this poisoned grain could be legally sold in this country; and whether or no, it should be carefully avoided.

Heating by the Combination of Warm Air and Steam.

The problem of successfully heating large buildings such as churches, chapels, public halls, and other buildings of the same class, is one of great interest and importance, but often of much difficulty. With the rapid changes in temperature peculiar to our climate, it is not easy to provide a system which, while being economical, shall allow of a building being maintained at the exact degree of heat required. The reason for this is not difficult to understand when it is considered that under the usual systems of heating it requires some considerable time for the building to become warm, and secondly, that it demands the outlay of the full capacity of the boiler, whether the thermometer stands at 60° or zero. The immediate result of a cold wave in such cases is that, in order to obtain something like comfort, and to heat the building as quickly as possible, the furnace is raised to a red heat. The effect of this is obvious to any person acquainted with heaters; the joints become loose and the products of combustion escape into the room, rendering the atmosphere stifling with dust and gas, and causing much discomfort to the occupants.

A system was much needed which, succinctly stated, should be powerful enough to warm a large building quickly and economically, and at the same time give facilities for rapidly reducing it as might be required. Such a system is that of the firm of Wier & Nixon, of No. 1410 North Street, Philadelphia, Pa. Here we have a heater which gives two separate means of heating—one by hot air and the other by steam. The effect is three-fold in its advantages; first, it permits of very rapid warming; secondly, it allows of the hot air being used by itself when the weather is moderately warm, and is thus very economical; and lastly, it utilizes the whole of the heat from the fuel, and substantially prevents all waste.

The apparatus are made in six sizes, both brick set and portable. In the back half of the fire chamber is a water back, against which the fire rests, and just above, standing upon two water legs across the center of the fire and in the middle of the combustion chamber, is a cylindrical boiler, and above it a steam drum. All these parts are incased by a steel dome, and are devoted entirely to the production of steam. On the outside of the dome, in conjunction with the fire cylinder, the hot air is generated. Check draughts are provided, and are worked automatically by boiler pressure. The whole construction is eminently well calculated to prevent waste and give great power.

The manufacturers have by this system successfully dealt with cases of extreme difficulty, and have rendered many buildings warm and comfortable which under all systems previously tried were cold and cheerless. They offer every facility for the examination of their system, and those who need heaters will do well to avail themselves of it.

IMPROVED PEDESTAL JOINTER.

The buzz planer or jointer is a machine so widely known and universally employed that a description of its many advantages and uses is unnecessary. Certain it is that it forms one of the most important factors in a woodworking establishment, and on account of the variety of work that may be done on it, has justly attained the position of a standard tool, which will always remain a great favorite among operators.

The machine illustrated in the annexed engraving is one of entirely new design, by the well known firm of Goodell & Waters, of Philadelphia. It has been very carefully contrived, with the view of combining in construction the advantages of simplicity, accuracy, and economy, and has the special improvement in the method of raising and lowering the tables by link motion, to adjust for different thicknesses of cut, which is considered by the manufacturers the best in use. Then there is little or no chance for oil or grit to wear the links: and the joints are close and accurately fitted, so that it is almost impossible for any foreign matter to get in those parts. When filing or adjusting the knives, one of the tables may be raised up entirely clear of the cutter head, leaving free access for the operator to accomplish his work.

These machines are made in four sizes, to work twelve, sixteen, twenty, and twenty-four inches wide respectively, as may be required. Every detail in construction receives particular attention, and a thoroughly first class tool is the result. For prices and further particulars, we refer our readers to the manufacturers, Goodell & Waters, Philadelphia, Pa.

THE WAINWRIGHT EXHAUST FEED WATER HEATERS.

Below we give a brief description of the Wainwright exhaust feed water heaters.

In Fig. 1 the water enters the heater through left-hand opening, fills the settling chamber and shell, and is there heated to a temperature of from 200 degrees to 210 degrees by contact with the corrugated copper tubes filled with steam, and escapes through upper right-hand opening. The exhaust enters at the base, thence through the corrugated tubes, and out at the top.

In heater Fig. 2, the water enters at lower left-hand inlet, and, after filling settling chamber, passes up through pipe into the corrugated copper tubes, acquiring a complete circulation by flowing up and down same before passing to boiler through upper right-hand outlet. This complete circulation of the water is effected by return bend castings in connection with the tube plates, thus forcing the water to pass through each tube separately. The exhaust enters through top of heater, surrounds the tubes filled with water, passing out at base, or *vice versa*.

Fig. 1.

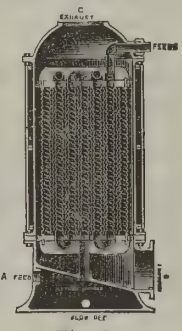


Fig. 2.

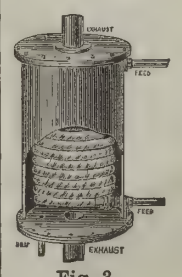


Fig. 3.

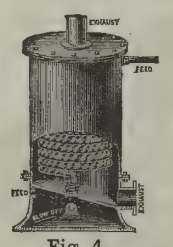


Fig. 4.

Fig. 3 shows another style of heater, with coil of corrugated copper tubing. The water is fed into the coil at lower right-hand inlet, and passes to boiler through upper right-hand outlet. The exhaust enters at the bottom of the heater, and escapes through the top, or *vice versa*.

In Fig. 4 the principle is the same as in Fig. 3, a settling chamber being added to receive all mud and sediment that may be in suspension in the water, and which may be blown out. The water enters at lower left-hand opening, fills the settling chamber, then passes up through corrugated copper coil, and is fed to boiler through upper right-hand outlet. The exhaust enters shell at right-hand side in the base, surrounds the corrugated coil, and escapes through cover, or *vice versa*. The superiority of corrugated tubing over plain is clearly shown in these heaters, increased heating surface being gained, and all annoyance from expansion and contraction being removed, it being absorbed in the corrugations, and thus danger from leakage is obviated.

The Wainwright Manufacturing Co., 65 and 67 Oliver Street, Boston, Mass., manufacture these goods, among their other specialties, their selling agent in this city being F. B. Aspinwall, at No. 93 Liberty Street. In Philadelphia and Pittsburg, their agents are Fairbanks & Co.

Artistic Coloring of Houses.

Among the beautiful houses which have been built during the past season at our fashionable summer resorts, that of Miss Jones, at Newport, R. I., which was designed by Peabody & Stearns, of Boston, attracts a great deal of notice.

The first story is of gray stone, and on the suggestion of Mr. Coleman (the celebrated artist), the shingled walls and roof are stained with No. 16 Dexter Brothers' English Shingle Stain," which is a perfect imitation of an old, weather-beaten shingle.

The effect of the whole house is charming. It has a look of age and comfort. It is rare that a house in its first season looks as if it had lived a long while; but the color and the grace of its architecture gives this house the whole appearance of an old Newport residence. At Bar Harbor, Mt. Desert, Mr. William Ralph Emerson has designed a club house for the fortunate summer residents, and it is now nearing completion. The design is novel, and so full of artistic feeling that any one would know that it was the work of an artist, even if Mr. Emerson's name had not been mentioned.

The outside walls are stained with this same stain to represent the weather beaten shingle, while the roof is stained with a moss green stain. The trimmings and window frames are painted an ivory white.

During the past few years the whole coloring of the outside of houses has changed.

The old idea that shingles must be painted so that the grain of the wood could not be seen gave no opportunity to the architect to make an artistic effect of color. Indeed, a great deal of the staining of shingles has been disappointing because poor, cheap stains containing benzine or water have been used. These cheap stains will wash off and streak the other parts of a house, or the colors will fade out.

There is no economy in using cheap stains, and the architects are specifying Dexter's English shingle stains, as these stains are made of the very best materials.

Acoustic Hints.

In regard to the acoustic properties of the building at North Clarendon, Pa., referred to by a correspondent, I would say:

1st. The conditions necessary for a full reply are not given.

2d. It is necessary to know the plan of the floor joists in the ceiling.

3d. Of what material are the side walls composed?

4th. When the room is comparatively vacant, can echoes be heard of sounds delivered from either end of the room? But I will answer provisionally.

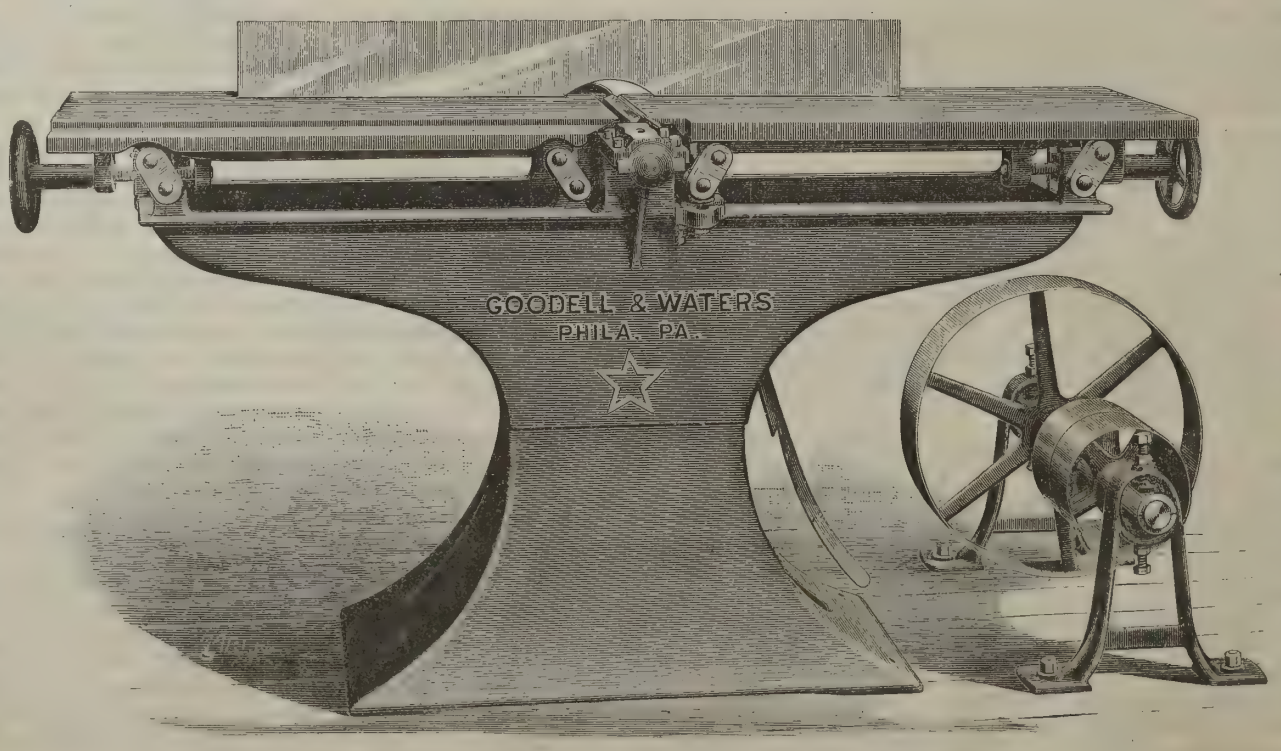
The building is 120 feet long by 43 feet wide, height not given. If speaking cannot be heard distinctly by a person in the back part of the room, it may be owing to the returned reflection of the sound waves from the cross joists or stringers, as some one has said to him.

Wires will be of no avail unless the room is properly ceiled. They cannot destroy the interference of sound waves from the reflection of the beams. The principle upon which the action of the wires is based is the phenomena of interference, by which unequal, non coexistent vibrations are modified and harmonized. It is possible to add one sound to that of another in such a series of vibrations as to produce silence. It is also possible to have these vibrations so intercepted as to clear the sounds transmitted of their confused murmurs, and it is this result the stringing of wires will produce when properly arranged.

But from the indistinctness of hearing complained of, I think what is needed is more resonance. This can be accomplished by ceiling the exposed joists with accurately tongued matched boards of seasoned pine, glued in the tongue and groove. They should be thin sheeting and narrow. A plastered ceiling would produce positively bad results.

The walls of the room ought not to be plastered. Pine sheeting is good, Portland and Rosendale cement better still. Fear of too much resonance need not be felt, because a great crowd of people will subdue all echoes if the seats gradually rise from front to rear.

K.



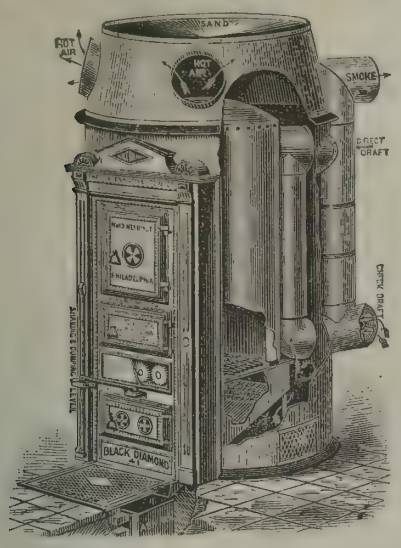
IMPROVED PEDESTAL JOINTER.

IMPROVED FURNACE.

Inventions are constantly being made which contribute to the convenience and comfort of the modern dwelling. Among the more recent ones may be mentioned the Black Diamond Furnace, as patented and manufactured by the Schoen Heater and Stove Co., of 13 North 11th Street, Philadelphia, Pa.

The general construction of these furnaces embodies all the principles of successful warm air heating. They have self-cleaning radiators, with direct and indirect draught, and being made of steel plate, with riveted joints, they are perfectly gas tight.

The grate is of peculiar construction, consisting of



THE BLACK DIAMOND FURNACE.

square steel bars passing through a series of pointed teeth of cast iron. These bars are operated by one lever, which controls the shake and dump of the fire. The grate surface is reversible, and all parts of the grate interchangeable and require no fitting. No bolts or screws are used in the entire arrangement.

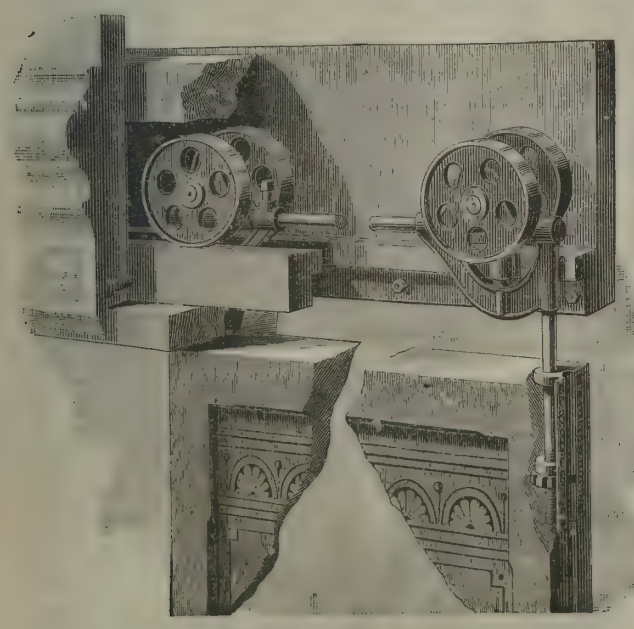
The self-cleaning ash pit is the most important improvement, and consists of an inclined bottom, which throws the ashes and clinkers forward into a pan which is placed in front of the furnace, below the floor level.

The considerable advantages and conveniences of this arrangement may be summed up as follows: Greater radiating surface is provided, the heat of the underneath side of the fire being utilized; a sure prevention from fire caused by hot ashes dropping from the furnace is effected; a perfect draught is insured by always having a clear grate surface, and generally there is a great saving of labor, dirt, and annoyance.

SLIDING DOOR HANGERS.

The inconvenience arising from badly hung sliding doors is often so great that many builders will employ the ordinary hinged door in preference, notwithstanding the considerable space in the room which they render useless. Foremost among these disadvantages are the cutting of the carpet, a projecting floor rail, and the manner in which the door is liable to stick, especially in the case of the heavier ones.

All these objections may be easily overcome by suspending the door on an efficient hanger. Of these devices a large variety, of more or less merit, are before



SLIDING DOOR HANGER.

the public. Of these not one exceeds in usefulness those made by E. C. Stearns & Co., of Syracuse, N. Y., under the title of "Warner's patent door hangers." They are simple in construction, economical, and are largely used throughout the country. The accompanying cut illustrates the general construction of the hanger, which is well designed to permit of easy adjustment by means of ratchet nuts, lowering or raising the door when necessitated by any settlement of the building, to clear a carpet, or for other purposes. The hangers are entirely hidden from view, and, being thoroughly made and lined with anti-friction metal, they are noiseless, and, what is of great importance, balance a door so accurately that it may be moved with the greatest ease.

The Cincinnati (O.) Corrugating Co.

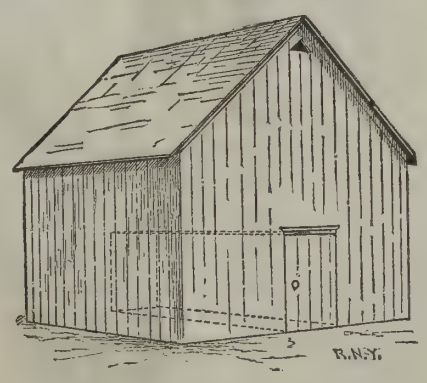
have for years used as their brand the word "Superior," and claim they bend every energy to the maintenance of the verity of their brand.

This is done by the closest attention to the minutest details—every sheet of iron being carefully inspected before painting, when even the smallest "pin-hole" compels rejection; by using the most improved machinery, all driven by steam power; by using none but the best metallic paint, thoroughly reground in pure linseed oil; by carrying the largest stocks of sheet iron in the United States, thus filling all orders promptly; by furnishing inquirers at once with detailed estimates.

They are abreast with the march of improvement, and only solicit a trial when you are in need of anything in their line.

AN ICE HOUSE.

The building is 12 x 16 feet on the ground, with 12 foot posts and studding 2 x 6 inches, 12 feet long, and covered with novelty boards, lined with hemlock, and the intermediate space filled with sawdust from the ground to nearly the top of the rafters. Through the center, the 12 foot way, I built a passage four feet wide, six feet high, with a partition on each side of four inch joists, covered and filled with sawdust, with three inch plank, four feet long across the top, for flooring. The door opening into the room is six inches thick, packed with sawdust and built like a refrigerator door, fitting tightly. In the rear of the passage I have a tank built into the ground for holding water and cans; immediately over the door an aperture, 2 x 4 inches, opens from the room into a ventilator of the same size, pass-



ing up along the inside of the building and opening at a small open window nearly at the peak of the roof, which keeps the room free from all foul and disagreeable odors. This arrangement leaves for ice a space 6 x 12 feet on each side of the room, and six feet high, above which the whole building is packed as full as it can be conveniently, and covered with sawdust or hay. The house is filled at the rear. By keeping the door closed as much as possible, the temperature within the room can be kept as low as 48 all the time, and as no warm air gets to the water, it seldom has to be changed. The ice need not be disturbed until the middle of July, and then not much is wasted at a time. Meat, butter and eggs can be placed upon a shelf out of the way and kept as well as in a refrigerator.—*Rural New-Yorker.*

Plans and Specifications.

Should any of our readers desire to procure plans and specifications for buildings, whether churches, schools, dwellings, stores, carriage houses, barns, etc.; or if they desire plans made for alterations, enlargements, or additions of any kind, to existing buildings; erection of porches, bay windows, extensions, wings, etc.; they are reminded that all business of the kind will receive prompt attention at this office, on very moderate terms. Address Munn & Co., 361 Broadway, office of SCIENTIFIC AMERICAN, Architects and Builders Edition.

IMPROVED TENT.

The accompanying engraving illustrates a tent which is the invention of Mr. Merritt P. McKoon, of El Cajon, San Diego Co., California. As the doorway is placed at the center of one side, the trunks or cots can be placed crosswise of the tent, and near the ends and end poles, thereby economizing room in the center of the tent, where it is most desired. This middle room can thus be occupied by table, chest, chairs, etc. The half diamond shaped ends form valuable "stow-away" places, or they can be curtained to form separate apartments when necessary. The center or point seam on each end is rope bound and brass linked over end pole iron spikes at the top of the tent, while the lower end of this rope is left loose for about 20 inches beyond the tent, to bracket over tent pin tightly or loosely at will, as dry or wet weather requires. This anchors the tent firmly and solidly, and insures its standing during the most severe gale. The angular roofing or awning over the doorway is of great value, as either one or both of the door flaps can be attached to the sides of the awning at pleasure, so as to obstruct the entrance of sun, rain, or wind when desired. A most agreeable shelter is provided. The tent presents a neat and most attractive appearance, and is as well

adapted for lawn or sea shore use as for actual hard camping service.

HOT WATER APPARATUS FOR WARMING DWELLINGS.

In this climate there are few subjects of more importance than the proper method of warming dwellings, and there is none that receives so little attention from those most directly interested, viz., those occupy the house.

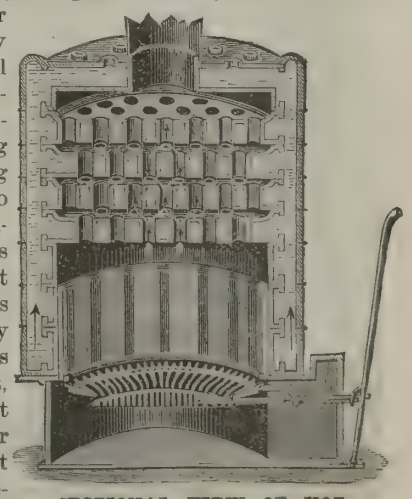
Hot water is now recognized as one of the best methods of warming dwellings, and, in the opinion of many, possesses a number of advantages over both steam and furnace. Among the apparatus for heating with hot water, the Gurney Hot Water Heater, which we illustrate in this connection, is justly considered one of the best. Originally manufactured and introduced in Canada, it has lately, under the energetic management of John A. Fish, been widely introduced into this country, and is meeting with a ready sale, and gives general satisfaction wherever used.

By reference to the engraving, showing sectional view, it will be seen that this heater has several novel features, and among these are the improved shaking and sliding grate, ironstone lining to fire pot, open water way, combustion chamber, and quincunx fire tubes.

The advantages may be briefly stated as follows: Hot water radiators will heat with a low fire, while with steam radiators no heat is given off until steam is generated, the amount of fuel consumed in first raising steam being practically wasted as far as heating the building is concerned; a saving of from fifteen to twenty-five per cent. in consumption of fuel; equality of temperature throughout all parts of the building; simplicity of the apparatus, an ordinary domestic being competent to take charge of it; durability—there being no pressure or strain on it, there is no wear or tear; the apparatus being open to the atmosphere, is perfectly safe, and entirely dispenses with the use of safety valves.

Then in addition the apparatus is easily cleaned both vertically and horizontally; and as the outside cannot be heated to more than 190°, there is no likelihood of fire taking place from the contact or proximity of combustible materials with the exterior.

Any time during the past twenty years, the advantages of hot water have been readily admitted on all hands, the practical method of application being the only thing questioned. So general is this admission of its superiority, that in greenhouses its use is practically universal, as it is recognized that, while steam heat is greatly inferior to hot water, hot air is greatly destructive to plant life. These facts should be full of significance to people of intelligence, familiar with the laws of health, and anxious to conform thereto.



SECTIONAL VIEW OF HOT WATER HEATER.

The Gurney Hot Water Heater, whose general offices are at 239 Franklin St., Boston, is recognized as one of the best heaters in the field, and those of our readers who are interested should write to John A. Fish, Esq., the managing director, for illustrated catalogue fully explaining this system.

THE GREAT NAVE, CATHEDRAL OF MEXICO.—[From a Photograph.]

[For description see page 91.]

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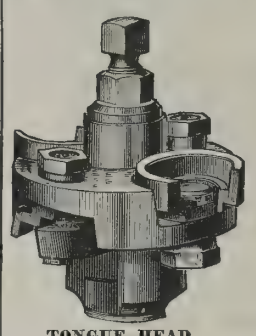
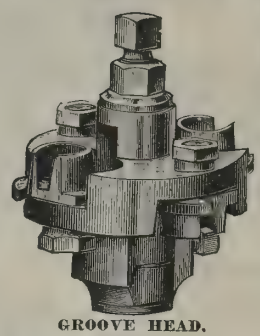


TONGUE HEAD.



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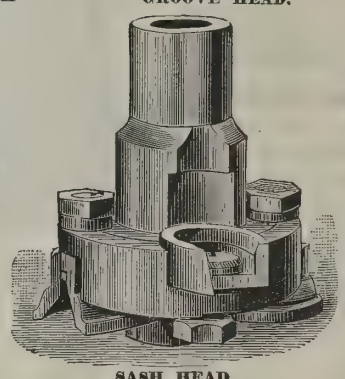

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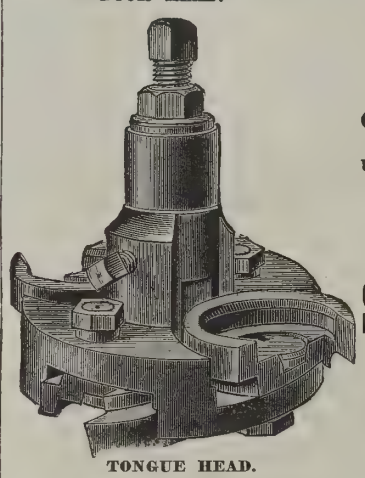

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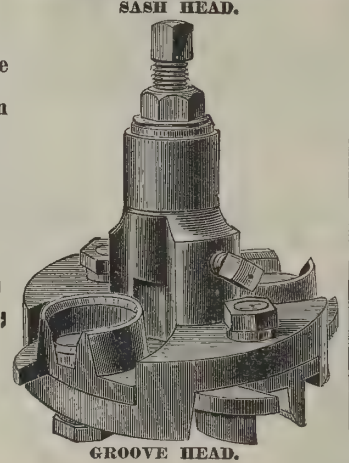

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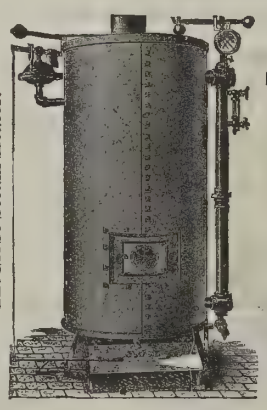

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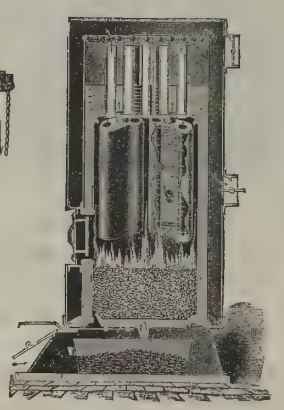

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. C. K. says: I want to know the best way to build and line a water tank, for taking water from the roof, and to supply the house for running bath tubs and water closets. A. The tank should be built of clear pine, 1¼ in. thick at least. The corners dovetailed together, or nailed to a strong frame. The sides and ends to be well braced to resist pressure of water. Line with tinned copper, not lead. The cost of either is about the same, but copper is more durable.

(2) A. J. M. says: I would like to know if there is any good reason why a good gum hose would not take the place of a lead pipe used to flush a water closet where the supply comes from a reservoir. A. For a short time it would probably answer, but for such a purpose, the best is poor enough. Therefore, it would be unwise and unsafe to use anything less durable than lead pipe.

(3) E. W. asks: What kind of shade trees could you recommend to plant in altitude of 6,000 feet, with a severe winter and a very hot summer? A. Cottonwood trees flourish best in such altitudes and climate.

(4) L. J. M., of Milan, Mo., asks what would be the best preparation for a cement to apply to a clay wall, for cistern or well. The question is ambiguous. If the well or cistern is laid with stones and bedded in puddled clay, the only cementing material to apply is puddled clay. If, however, the well or cistern has been excavated in clay soil, the best cement to bed the brick or stone lining with would be any good hydraulic cement, such as the La Salle cement, of Illinois, or Fort Scott, Kansas, which are near at hand. One of the best plans would be to build the wall of the well or cistern with a lining of Beton concrete, and cover the interior face with a thin coat of hydraulic cement.

(5) T. S. says: Please give the process of engraving, and of what materials the plates are made from which the detail sheet is printed. A. The plates are produced by photography on plates of sheet zinc.

(6) N. P. K. wants a receipt for taking varnish off of furniture. A. Use a solution of about 3 pounds common washing soda to a gallon of water. Apply this to the work with a common paint brush, and after allowing it to stand for a short time the varnish can be removed with an ordinary stiff scrubbing brush.

(7) J. M. asks how to polish bullocks' horns. A. First scrape with glass to take off any roughness, then use pumicestone powder with a piece of cloth wetted until a smooth face is obtained. Next polish with rottenstone and linseed oil, and finish with a piece of clean linen rag. The more rubbing with the rottenstone and oil, the better the polish.

(8) G. A. B. asks: Would not cypress be a far better wood to use for stringers and ties for street car tracks than either white or yellow pine? A. No. Cypress is more durable in damp places than pine and is stronger, but it has the serious disadvantage of springing in its length, which renders it unfit for car track stringers, although some varieties are free from this objection, and could be used for the purpose. The cost of cypress is about one-third higher than pine, which is in itself a drawback to its use.

(9) J. B. asks: 1. A recipe for polishing gun stocks, in which neither varnish nor shellac appears, as they are not allowed. A. Mix boiled linseed oil and turpentine, equal parts, for a polish. Rub the gun stock with a piece of paraffine or clear beeswax. Then rub the stock with a few drops of the polish on a woolen cloth to a smooth surface, and brighten with a dry cloth. 2. How can lead be silvered? A. By electro-plating, making the anode about three times that required for German silver, and the battery power strong, but not too intense. Let there be a good deal of free cyanide in solution.

(10) D. A. D. and S. H. ask for the recipe for a blackboard preparation. A. Take ½ gallon shellac varnish, 5 ounces lampblack, 3 ounces powdered iron ore or emery; if too thick, thin with alcohol. Give three coats of the composition, allowing each to dry before putting on the next; the first may be of shellac and lampblack alone.

(11) J. C. M. asks how kerosene oil can be made a red color. A. Use the extract of alkanet root, sold under the trade name of alkanine, or make your own extract and color with that.

(12) G. S. asks what is good to put in a tumbling barrel to polish brass and zinc, and how is oxidizing done on brass? A. Sawdust and pulverized charcoal are used. Also leather skivings and charcoal. Oxidize brass by exposing for a few minutes to the fumes of sulphur in a close box.

(13) R. S. asks: Is water compressible? For a long time liquids were regarded as being incompressible, but since then researches have been made on this subject by several physicists, and their results have shown that liquids are really compressible. In Ganot's Physics, in the chapter on Hydrostatics will be found an interesting account of the method of determining the compressibility of a liquid by means of an apparatus called a piezometer. Water experiences a compression of 0·00005 part of its original volume. The compressibility of sea water is only about 0·000044; it is not materially denser, even at great depths; thus at the depth of a mile its density would only be about one one-hundred-and-thirtieth greater. For water and mercury it was also found that within certain limits the decrease of volume is proportional to the pressure.

(14) W. M. S. asks how to make liquid glue. A. Take a wide mouthed bottle, and dissolve in it 8 ounces best glue in ½ pint water, by setting it in a vessel of water, and heating until dissolved. Then add slowly 2½ ounces strong nitric acid 36° Baume, stirring all the while. Effervescence takes place, with generation of fumes. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any time.

(15) W. H. C. asks: 1. Can water be said to belong to the mineral kingdom? A. It is treated as a mineral by authorities on the subject when occurring in the earth. It forms the larger proportion of the human body, and then cannot be so considered. It may be termed of intermediate nature. 2. Can the reflections of a red dress in a mirror be called red? A. Reflection is only changing the direction of a ray of light or color, and has nothing to do with its make-up. The pictures seen in a glass are spoken of as of the colors they reflect.

(16) C. R. asks: 1. How can I make cotton cloth, such as American drill, calico, etc., waterproof without painting, or having to spread anything on it that would damage its texture or softness? A. See the articles on this subject contained in Scientific American Supplement, Nos. 58 and 317. 2. There is a freezing mixture composed of sal-ammonia, saltpeter, and common soda. Can you give me the formula? A. Take 8 parts of sulphate of soda, 5 parts each of sal-ammonia and saltpeter. When about to use, add double the weight of all the ingredients in water.

(17) B. & G. ask: Is there any preparation which will prevent flies and other insects from lighting on and specking windows, etc.? A. Make a strong infusion by boiling smartweed for a few minutes in water. When cold apply it to the glass, and for twenty-four hours it is quite effectual in keeping away flies and insects.

(18) J. O. S. asks: How can I polish or varnish piano legs that have become dingy? A. To do such work well is laborious. Clean and smooth the surface well with rotten stone on a wet woolen rag, and follow with vigorous work with a chamois skin. Then to 2 ounces of melted white or yellow wax add 4 ounces turpentine, and give a good covering coat.

(19) J. W. H. writes: If a wheel, say an undershot one, is placed in a stream running from a reservoir, what portion of the water that works it can it be made to pump back into the reservoir from a pool below, say at a depth of 15 feet from the surface of the water in the reservoir? A. From 40 to 50 per cent into its own reservoir.

(20) H. C. asks if there is at present any practical plan for heating house furnaces by crude coal oil. A. Experiments and trials have been made in this line, but so far the odor has been a most objectionable feature, while the management and watchfulness required is more than an offset to any supposed economy.

(21) J. W. H.—The best form of chimney is round, and about 20 times the diameter in height for large chimneys, and from 30 to 40 times the diameter for small chimneys. Chimneys should be adapted in size and height to correspond with the volume of heated products of combustion. There is a little work by Armstrong that will give you the figures, "Chimneys for Furnaces, Fireplaces, and Steam Boilers," 50 cents, which we can furnish.

(22) J. P. P.—It is extremely doubtful if you can rip 1½ pine and hard wood with a 6 or 8 inch saw with any speed or comfort. You will find it hard work to cut half through by foot power. You can rabbet with a wide saw or a wabble saw. We can recommend "Art Furniture Designs," 4to, $3.00; Eastlake's "Hints on Household Taste," 8vo, $3.00, which we can furnish.

(23) W. L. T. asks for a receipt for gilding and silvering on wood. A. The wood must be coated with size. To make this, boil half a pound parchment shaving with three quarts of water, constantly stirring. This gives a clear solution of gelatine, which must be passed through a sieve. Paint over the wood with this, and while it is still moist apply gold or silver leaf or Dutch metal. Much manual skill is necessary, and you should see the exact details practiced by a gilder. You may also gild wood by mixing bronze powder with copal varnish and painting it with the mixture. Finally, gold paint may be bought all ready for use, and this will probably give you the most satisfaction.

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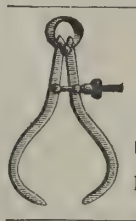

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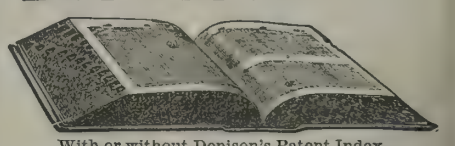

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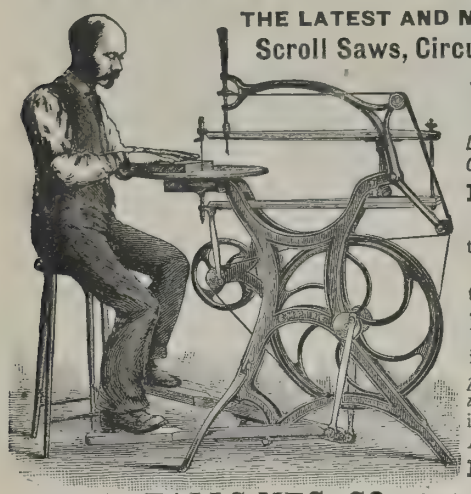

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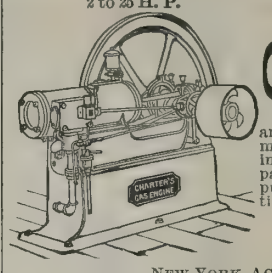

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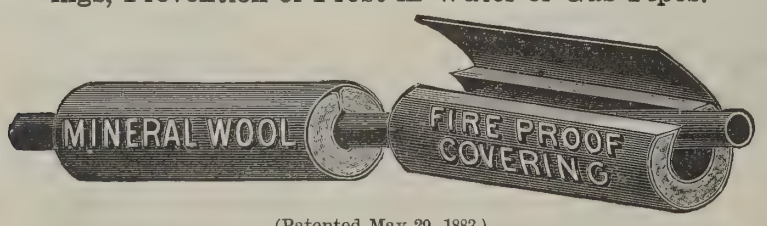

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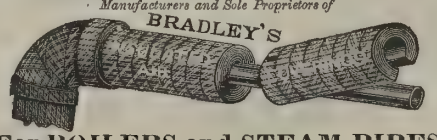

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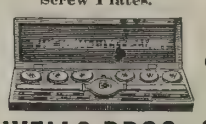

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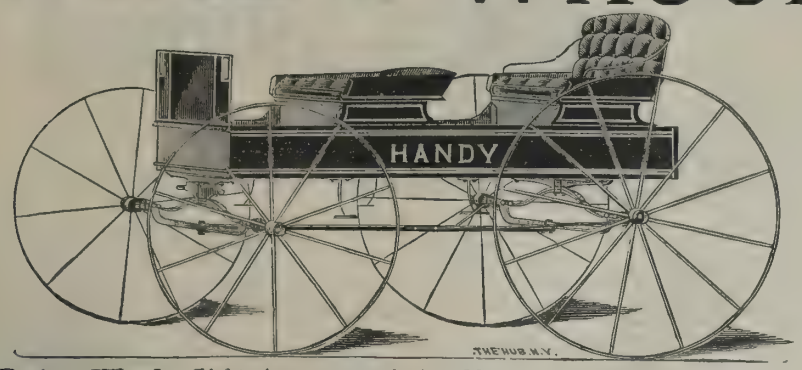

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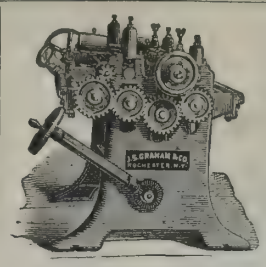

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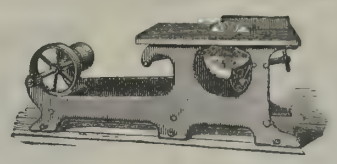

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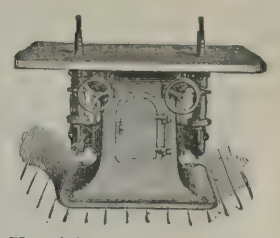

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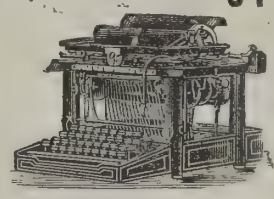

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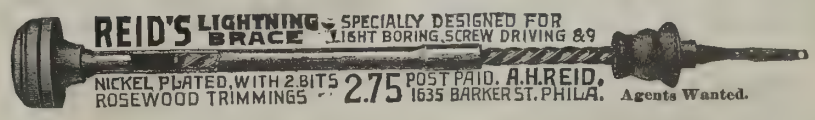

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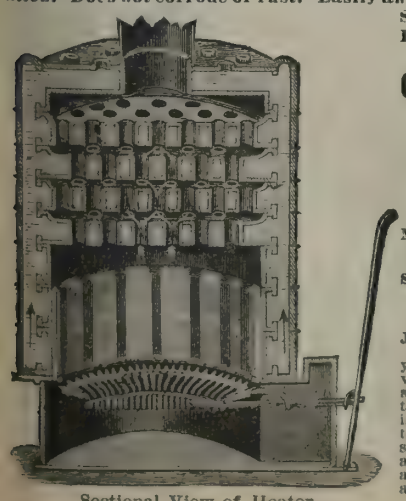

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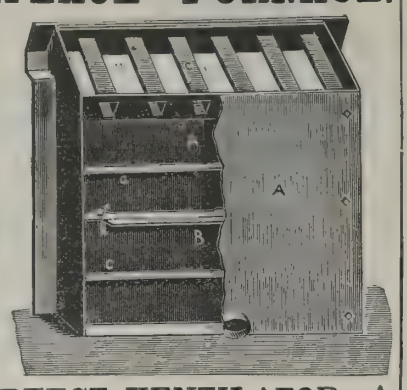

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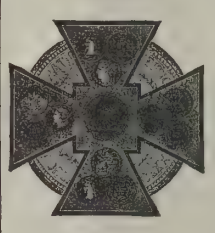

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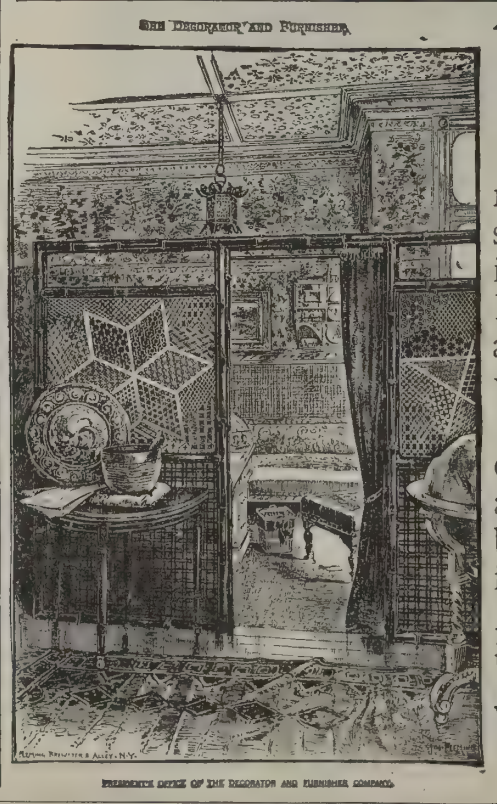

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Weather Vanes.
Thos. W. Jones i

Well Tools.
American Well Works vii

Window Sash Cord.
J. P. Tolman & Co ..... cover ii

Wood Carpet.
J. Dunfee & Co vii

Wood Filler.
Bridgeport Wood Finishing Co vii
F. W. Devoe & Co vi
Wm. T. Lindeman & Co ..... cover ii
D. Rosenberg & Sons vii

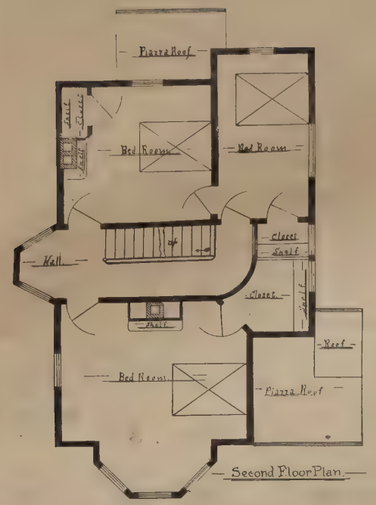
Wood Water Pipe.
A. Wyckoff & Son ii

Woodworking Machinery.
Battle Creek Machinery Co v
Connell & Dengler ii
E. & F. Gleason v
Goodell & Waters v
J. S. Graham & Co i
Hoyt & Bro i

Wrenches.
Geo. W. Marble x

Front Elevation.

Side Elevation.



Second Floor Plan.

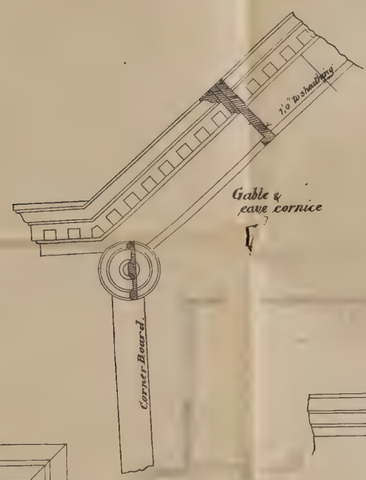
Cellar Plan.

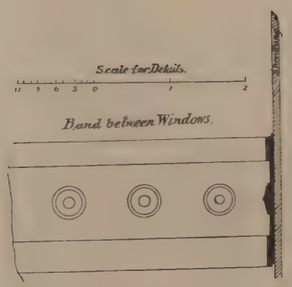
Piazza Details.

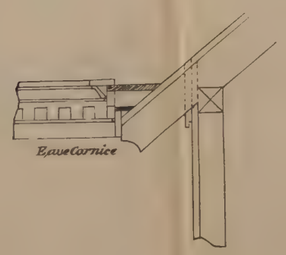
Rear Elevation

Side Elevation.

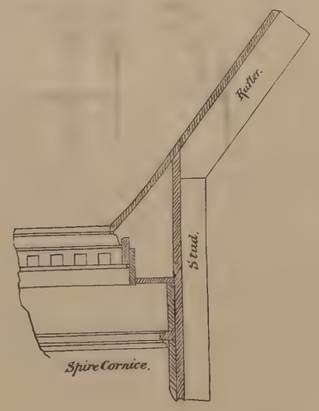
A Cottage adapted for Future Enlargement.

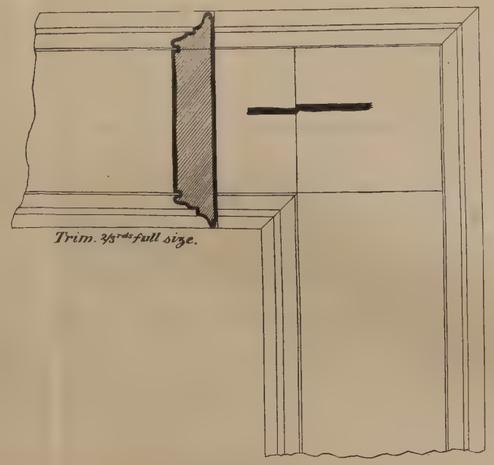




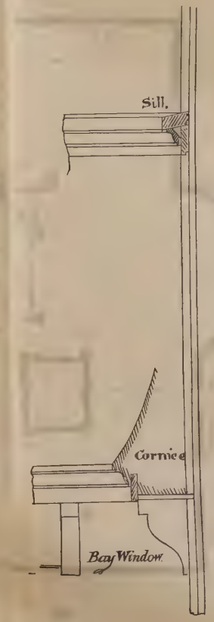


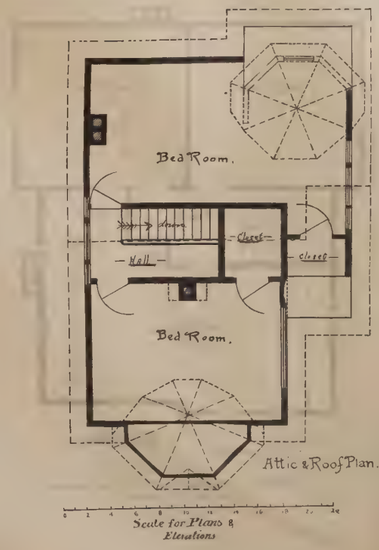
Eave Cornice





Trim. 3/8rds full size.

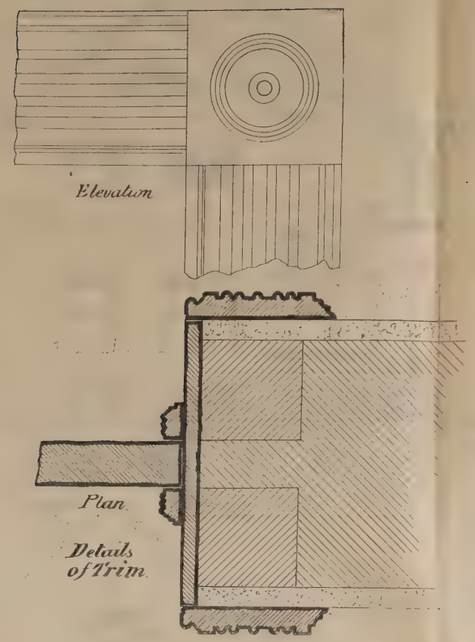


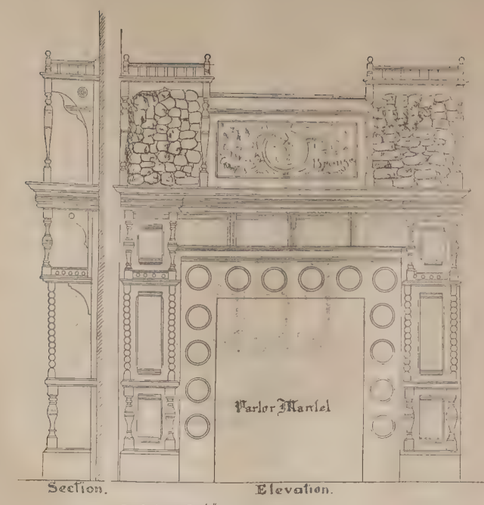


Details to accompany Colored Plates. For description see Architects and Builders Edition of Scientific American for April, 1887.

FRONT ELEVATION.

SIDE ELEVATION.





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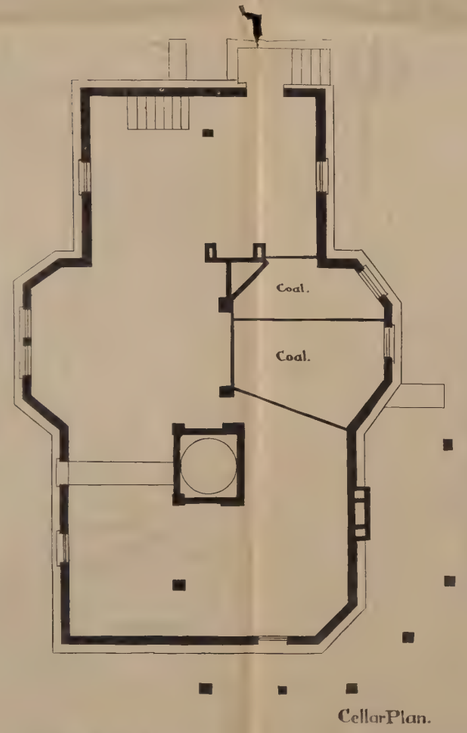
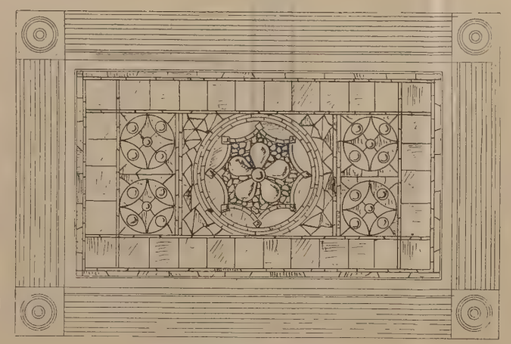
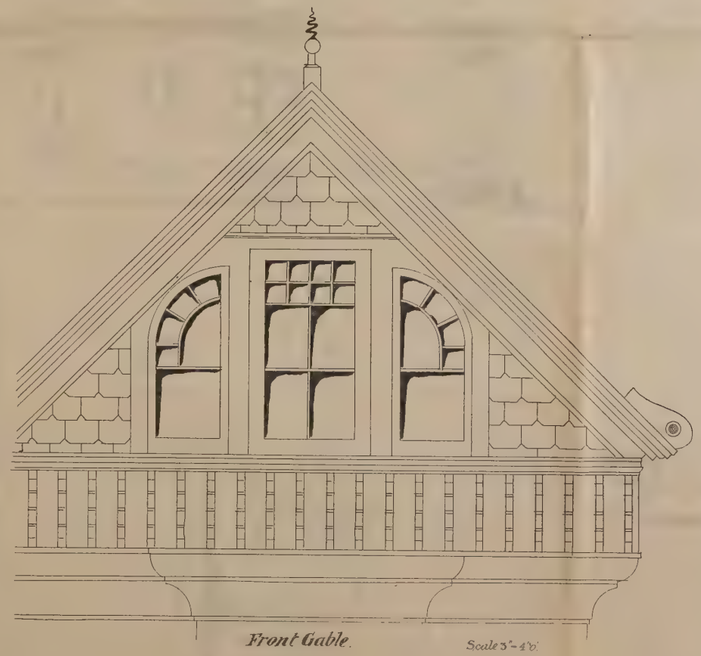
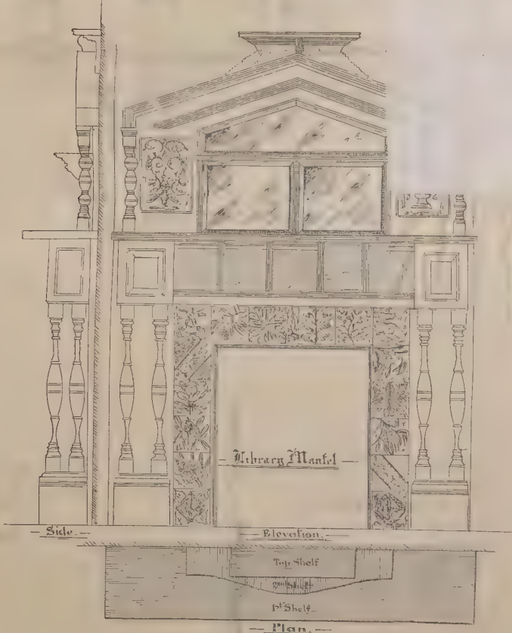




Dining Room Window





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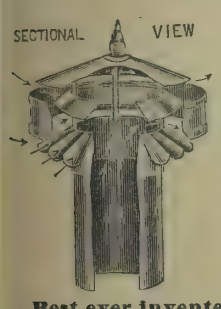

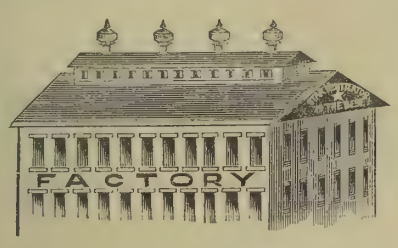

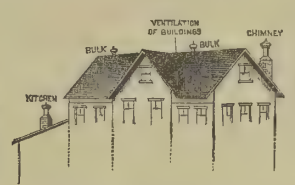

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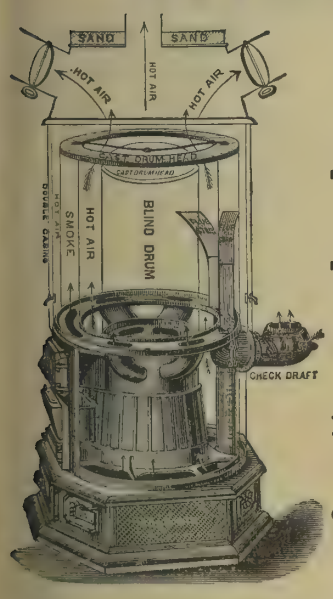

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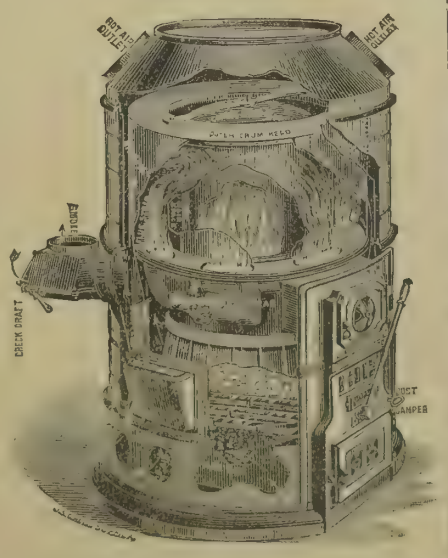

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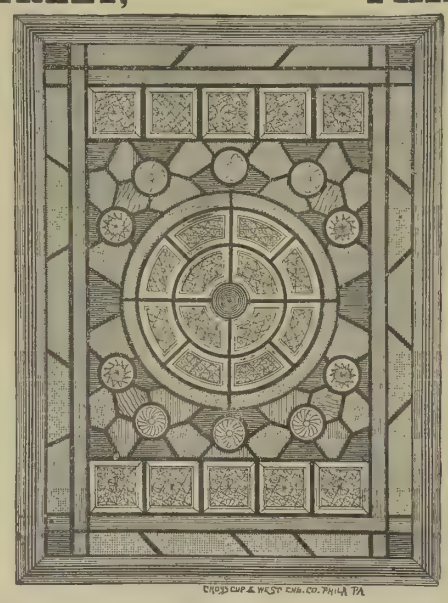

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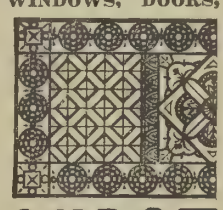

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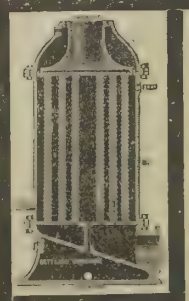

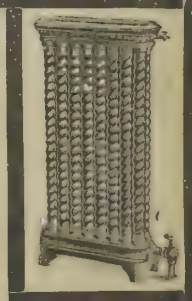

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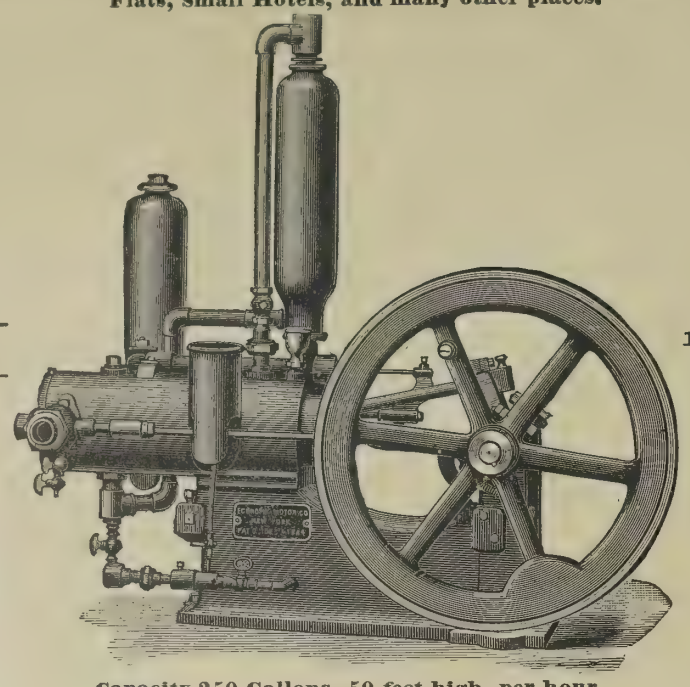

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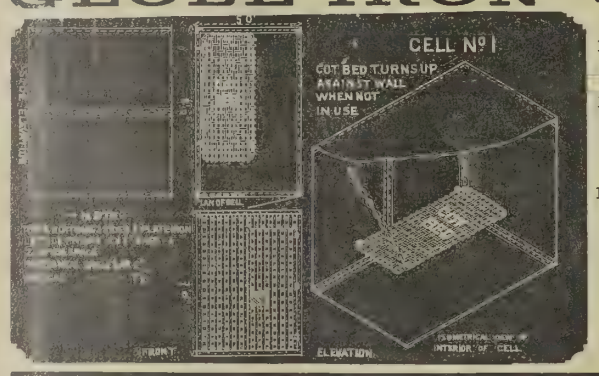

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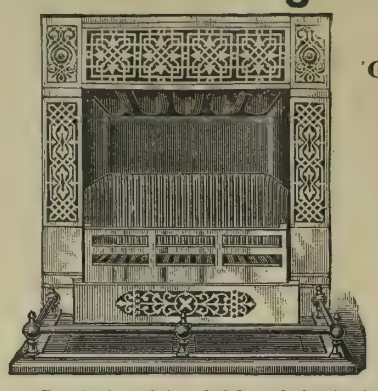

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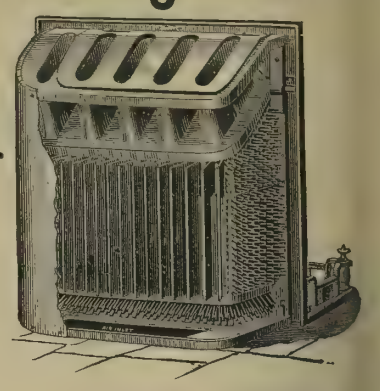

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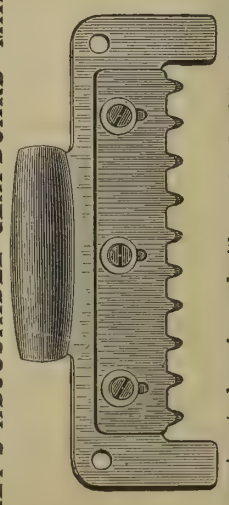

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THE QUEEN OF ENGLAND'S COTTAGE AT CANNES.

Her Majesty, with Princess Beatrice and Prince Henry of Battenberg, lately passed four or five days at Cannes. Her Majesty resides at the Villa Edelweiss, which has been placed at her disposal by Mr. Savile. Cannes has been frequently described, and recent letters have given some account of its social life among the numerous English visitors, including many persons of rank and fashion, and of the visit of the Prince of Wales to that place, which, happily, was spared all serious injury from the earthquake that disturbed and damaged several other towns of the Riviera. It is a town of 15,000 people, including the average number of visitors, 120 miles from Marseilles, 79 from Toulon, and 20 from Nice. Its situation, extending four or five miles along the shore of the Gulf of Jouan, Cape Croisette, and the Gulf of Napoule, affords a variety of delightful sea views, and the valley of Le Cannet, and other sheltered parts, enjoy complete protection from cold winds, at least from the northerly and northeasterly winds, being shielded by the Esterel and the Maritime Alps, the hills rising there, on three sides, 800 ft., 1,500 ft., and 2,000 ft. in height. The latitude is nearly the same as that of Florence, and the sun has great power even in winter, the average temperature at that season being ten degrees higher than in England, with no fog or damp, and with little rain. The air, however, is bracing and stimulating, and proves beneficial to many invalids. Until 1834, Cannes was little known to foreigners, but in that year Lord Brougham, then our lord chancellor and a personage of great political importance, chose it for his annual winter residence, and his example was largely followed, and there he died, in 1868, ninety years of age. The accidental death, as it must be considered, of the late Duke of Albany at Cannes, on March 28, 1884, has rendered the place more interesting to the English royal family, and to all who cherish that esteem for the memory of the lamented prince which is now perpetuated by the erection of St. George's English Church, opened a few weeks ago in the presence of his royal brother the Prince of Wales. It is not unlikely that the Queen's present visit to Cannes may have been prompted by a desire to see for herself this permanent memorial of a sad event in which the affectionate feelings of a mother must always be deeply concerned.—*Illustrated London News.*

THE QUEEN OF ENGLAND'S COTTAGE AT CANNES.

Making Roads.

Few people know how easily a good and properly macadamized road can be made, or understand how excellent and enduring such a road is. A man who thoroughly understands the system, and sees it carried out properly, will make a better road with a few inches of broken stones than others will make with three times the quantity of material, not to mention useless labor. Macadam cared very little what sort of a bottom he had to deal with, if it were not an absolute morass, and he was not often deterred by that. "For a road," he says, "it is not necessary to lay a foundation of large stones, pavement, etc., as it is a matter of indifference whether the substratum be hard or soft, and if any preference is due, it is to the latter." These statements look like heresy compared with much that we have read on road and walk making, but the great road maker was right, nevertheless. First of all, whatever the bottom was like, he took care to see that the ground had evenly settled before the stones were spread upon it, that there might be no subsidence in any part afterward to cause inequalities, a matter which is often overlooked. When the roadway had to be cut and leveled, large stones dug out of the ground, or any inequalities to be made up, the ground was afterward left to settle before proceeding further with the work. In putting on the stones, quite as much care was exercised.

The hardest stone in the district was procured—granite, flint, or whinstone; next, it was broken to the regulation size—in pieces about an inch in diameter, though a rougher size will do; and, lastly, the stones were not laid on the road, but spread shovelful after shovelful to the depth of from 6 inches to 10 inches, which was considered sufficient for general highway traffic. The road was made slightly higher in the center than at the sides, to throw off the water, as the object was to form an impermeable crust that would keep the water from percolating to the bottom, thereby rendering it soft and causing it to work up, the necessary drainage being, of course, secured in the usual way. This is macadamizing in the proper sense of the term, a system which has nearly superseded every other, but it is the attention to trifles in carrying it out that makes perfect work. For example, many people would attach little importance to the stones being broken or angular, and be quite as indifferent about the mode of spreading them on the road; yet these are two of the most important points. The use of water-worn stones of the same size will not make a solid crust, because they yield to pressure, their round surfaces offering little or no resistance; but it is different with broken stones, which when of uniform size, and clean, and properly spread on the ground, set fast on the same principle as that of an arch. I have seen roads made on an extensive scale on this system, and had to make such myself, and I have never seen anything to equal them.

Walks, which are often cut out deep and filled in the bottom with large stones, may be made on Macadam's principle with far less trouble and with much better results. Broken stones, to the depth of 2 inches or 3 inches, will be quite sufficient, and they should, after being spread on, be beaten even on the surface with broad wooden rammers. This sets the crust effectually at the beginning. Afterward a thin coating of clean gravel should be spread upon the surface to hide the stones, but no more. Such a walk is smooth and firm, and comfortable to the feet in all weathers; rain only washes it clean, and frost has not the least effect upon it if the bottom be drained. The material holds no moisture to freeze; it is the accumulation of soft gravel on the surface of walks that freezes and renders them so muddy and uncomfortable afterward. With us the stones are broken by a machine to any size we want them.—*J. S., the Garden.*

A COAT of boiled linseed oil rubbed over the iron scale beams used in damp cellars in which large quantities of salt are used in curing hides, and allowed to dry, is a good preservative. As the oil gets rubbed off, rub the parts again with the oil upon a cloth.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

NEW YORK, MAY, 1887.

THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

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USEFUL HINTS RELATING TO HOUSE BUILDING.

We continue our remarks from February number. A good size for the lot for a house to cost about $5,000 is 60 × 150 ft.

If a stable in the rear is needed, the lot should be not less than 175 feet deep. This point, and those mentioned in the February article, are the most important to be considered concerning the *lot.*

The next subject to be settled upon is the plan and specifications for such a house as your limit of cost will cover. This is a most difficult undertaking, and often ends in disappointment, usually because *too much is expected for a given sum of money.*

If style of interior and exterior is required, the *size* must be curtailed. If the rooms must be spacious and numerous, then the style and finish must be plain and unpretentious, both within and without.

Of one thing be assured—everything cannot be obtained for $5,000 at the present cost of labor and materials.

This point fully understood, the writer has found that the quickest and best way to get the plan desired is to *look at houses already built* in the immediate neighborhood or adjacent towns, which approximate to the cost named. Among the many which are now to be seen in all our suburban towns, there will be no difficulty in finding a house which will entirely satisfy the requirements. No mistake can then be made in the *cost,* for the builder himself is near at hand to duplicate for you, for a definite sum, the house you may select.

Disappointment in architectural effect will not happen—because you can see beforehand what an appearance the *finished* house will present.

It is far better to go to an architect with *ideas well defined* of what is wanted, and to ask of him to add to these his own taste and skill, than to go (as many do) with nothing settled in the mind but the *cost,* and to require of him to produce something entirely original in design and finish. His effort to fill such an order is generally a failure, not from any want of skill on his part, but rather because of his inability to grasp the intangible and indefinite ideas which may be in the mind of another. He must have some standard to work up to besides simply the *cost.*

If the architect succeeds in his effort as to the plan, you may consider that you have made a fortunate beginning.

The specifications come next. As for these, let them be most carefully drawn, leaving nothing open, indefinite or obscurely stated, and to this end you could not do better than to read over the several specifications published by this paper, selecting therefrom the best points in each. Above all, have them so drawn that they cover everything you want. Otherwise you will have extras, which are always very costly.

It is a remarkable fact that anything *taken from* the specifications, after the contract has been signed, you can get no allowance for; but anything added to them greatly increases the cost. Why this should be so, only the contractor can tell you, and he generally *will not,* You may imagine, however, that the reason is, because, when the contract is once signed, he (the contractor) *don't want* to make any allowances, and *does* want to make all he can out of extras. Hence you must plan beforehand so as to avoid them. Or, in the pithy words of the late Rev. Henry Ward Beecher, "First think out your work, and then work out your thoughts." This applies pre-eminently to building operations.

COLD ROOM FOR EGGS, ETC.

To make a cold room or ice house that is dry or as free as possible from sweating, for preserving eggs, fruit, etc., make the room itself in any manner most convenient, but thoroughly insulated in regard to keeping the walls impervious to circulating air currents or crevices for interchange of cold and warm air, except under control, for the necessities of ventilation, which should be small.

A frame lined upon the inside with heavy paper and varnished with shellac, then ceiled and floored with matched pine, ⅝ or ¾ thick. Varnish the entire inner surface. Before putting down the paper lining and floor, fill in between the framing dry sawdust and pulverized charcoal mixed. Board up the outside with tightly matched boards, filling in as you board up with the saw dust and charcoal, as well as every part of the top, with the exception of the door for putting in the ice, as described further on.

The door for entrance to the room must be made to shut against broad jambs and angular closures like an iron safe, so that it cannot stick by swelling. It should be made by framing and packing with sawdust and charcoal, in the same manner as the room.

In the ceiling of the cold room frame an opening large enough to let in a galvanized sheet iron box of sufficient size to hold as much ice as you may wish to store, or about one-tenth of the capacity of the whole room. The ice chamber should be fitted into the opening tight, with a flange all around the top. It may be made of No. 18 or 20 galvanized sheet iron. To the bottom attach a coil of galvanized iron or lead pipe, running two or three times around the room, hanging on hooks or brackets, just below the level of the ice box. Pass the end of the coil through to the outside of the room and terminate in an inverted siphon, so as to retain the water within the coil up to a level just below the bottom of the ice box. This is for the purpose of economizing the cold from the waste water by circulating it around the room. From the cross beams of the ceiling, as bearing for the weight of the ice, place two or three straps of square iron of a size sufficient for carrying the weight of the ice you intend to put in. Let them hang upon the inside of the galvanized iron box to within an inch of the bottom. Upon these traps lay a hardwood grating. Make a galvanized iron cover to fit tightly upon the ice chamber, and a wooden one to close over the iron one.

To prevent the water that may be condensed upon the outside of the ice chamber from dripping down upon the goods, make the bottom of the ice chamber bulge a little downward, so that the condensed drops will run to the center, or one side, where a small pan may be hung, with a small pipe leading to the outside of the cold room, and a siphon attached to prevent ingress of air. The ice chamber may now be charged to its full capacity with ice, and if a very cold room is required, sprinkle a layer of salt between each layer of ice. Salt is seldom used for such rooms.

The principle upon which this cold room is constructed is that there shall be no communication between the ice with its moist vapor and the air of the cold room. Any moisture made by the cooling of the air, and which is precipitated upon the iron surface of the ice chamber, is at once conveyed out of the room by the drip pan and its pipe. Hence there is no need of any special ventilation, more than what will naturally occur by the use of the door and the small leakage through its closing crevasses.

The ice chamber requires no ventilation, hence economizing the ice to the best advantage, while the water from the melting ice is turned to the best account by circulating round the room in the waste pipe.

The best temperature for eggs and fruit is about 34°, or any temperature below 40° and above freezing, where this kind of stock is often changing by sale. If stock is to lie for a considerable time, 34° should be obtained if possible.

NEW WAY OF BUILDING CEMENT WALLS UNDER WATER.

Concrete made with hydraulic cement will set or harden under water in the most perfect manner, at al- any most depth, but a difficulty has heretofore been experienced in depositing the concrete at the spot required without exposing the concrete to injury by washing when passing down through the water. This difficulty has been overcome in a very simple and effective manner by Mr. John C. Goodridge, Jr., C.E., of this city. He incloses the concrete in paper bags, and by means of a wooden chute or slide sends the concrete down by gravity to the spot required. The bags break open on reaching the bottom, and the concrete thus reaches its destination without injury from the water. This method was recently employed by Mr. Goodridge in repairing the great dam at Holyoke. About sixty thousand cubic feet of concrete wall were in this way built under water. The concrete was composed of Portland cement 1 part, sand 4 to 5 parts.

THE NEW LAW COURTS, BIRMINGHAM.

Her Majesty the Queen, on March 23 last, laid the foundation stone of the new Law Courts at Birmingham, of which we give an engraving from the *Illustrated London News.* Its principal front, in Corporation Street, will be executed in terra cotta, which is considered to be a material likely to resist, better than stone, the damaging effects of a smoky atmosphere. The architects are Mr. Aston Webb, of 19 Queen Anne's Gate, Westminster, and Mr. Ingress Bell. The style is Tudor Gothic, enriched with many ornamental details in harmony with the general composition, and the central main entrance, with its circular doorway surmounted by a pediment containing sculpture, the balustrade rising to an angle beneath a projecting turret, flanked by two lower turrets with cupolas, will have a good effect. The central part of the facade, with its grand windows, the dominant oriel in the roof, also the towers, and the gables of the wing buildings, equally well bear out the character of this architectural design. The interior will contain a fine hall, 80 ft. long and 40 ft. wide, the large windows of which are to be filled with stained glass, a Queen's jubilee memorial, representing some events of her Majesty's reign, two large assize courts, with rooms for the judges and the juries, and a bar library, three borough courts, and a coroner's court, with offices and waiting rooms. Above these will be grand jury rooms, and other apartments. In the basement will be a police station, with cells for prisoners. The whole building, which will cost £78,000 ($390,000), is to be constructed at the expense of the Birmingham corporation.

A RESIDENCE AT ORANGE, N. J.

The colored plate and supplementary detail sheet of this issue illustrate a house recently built at the corner of Tremont Avenue and Center Street, Orange, N. J., for Mrs. E. C. Raphel, from designs by Joseph A. Stark, Esq., the distinguished architect, of 12 Chambers Street, New York City.

The house forms a very commodious and complete family residence. It shows many original features of design, and its plan is remarkable for convenience. The house is very substantially built. The internal trim is plain, in oil finished white pine, but there are window backs throughout the first and second floors, and plaster cornices in all rooms except on third floor. The stairs are in hard ash, also the inside shutters and the front entrance door. The plastering is three coat work, with very best hard finish in all stories.

The cost of the house, complete, including all work enumerated below, and also including mantels, tiles, and fittings of three fireplaces of first floor, and mantels and tiles of two bedroom chimney breasts, also hot air heating, electrical service, and stained glass—in other words, the house ready for occupation—was $7,000.

The grading and laying out of the grounds, also bluestone flagging on streets, and fences and gates, are not included in these figures, neither is the architect's commission.

This residence was planned with the view of having a maximum space on each side of the house, and it is, in consequence, somewhat narrow and deep. The three reception rooms follow one behind the other, but each has access to the principal hall. The smoking room and gentlemen's lavatory, on the north side, are a feature of this house, and stamp it as a first-class residence. An inspection of the plans will show many other points of merit, especially in the plumbing department. The large front room of the third floor, which is marked "billiard room," and which would also make a capital nursery, is a great point. It must not be forgotten that this floor is a full 9′ story. It has hot air in every room, and in the rear there is a water closet and wash bowl. The house throughout, from cellar to top, is uncommonly light and cheerful, all stairs and hallways are wide, and the floors are high.

The exterior design shows a substantial structure, well proportioned, symmetrical in parts, and, withal, picturesque. There is much interesting detail at various points. The sides are clapboarded, and there is a belt of shingles. The main roofs are slated. The piazza and balcony roofs are shingled, for color effect. The external chimney stack of south elevation (see supplementary sheet) looks very fine. The piazza is wide and airy. The double Mansard roof adds breadth and importance to the house.

Following is an outline of the main items of the specifications:

The cellar walls are 18″ quarry stone, laid up in cement mortar, and topped with an 8″ brick wall, faced with Hackensack bricks. The cellar walls are cemented on the outside, and the floor is of concrete, with cement face. The plastering is three coat work, hard finished, and there are cornices and ceiling centers to all rooms of first and second floors. The floor timbers are shown on section. The frame is of usual studding, sheathed, papered, and clapboarded or shingled. The roofs are slated, underlaid with felt.

Trim throughout in white pine, stained and hard oil finished.

Floors all white pine, except hall, which is yellow pine.

Sliding doors are five panels, others four panels, 1½″ pine doors, with brass bolt locks.

Front door is executed in ash to design.

Sashes all have double thick glass.

All windows have paneled backs.

Inside ash shutters are provided as indicated on plans.

Other windows have outside blinds.

All rooms have picture mouldings.

The closets are all fitted up, and the pantry has two glass cases.

The outside of house is painted two coats.

All windows and doors have ash mosquito screens.

The principal stairs, from first floor to top, are of handsome design ash posts, rail, and balusters.

The range is Boynton's No. 8 Prize range, 40 gallon galvanized iron boiler.

Cast iron kitchen sink and slop sink. Planished copper pantry sink, 16 oz.; 16 oz. 6′ bath tub.

Two marble top wash bowls, two Triplex wash-out closets, one spring seat hopper closet, one enameled iron wash bowl, two wood laundry tubs, are among the items provided.

Pipe for hot and cold water, A A lead, with wiped joints, and all faucets, stop cocks, traps, and plumbers' and tinners' work generally of best quality.

Electrical service is provided to principal rooms.

"Economy" hot air furnace, with supply to all rooms; Tuttle & Bailey's registers.

The soil pipe has a disconnecting trap, with fresh air inlet pipe, and the cesspool has three overflow branches.

The materials and workmanship are of the best description, and the house is substantially and completely finished in all its minor details, and is giving great satisfaction to the occupiers, and is very generally admired.

The contractors were as follows:
Carpenters—P. B. Fairchild & Co.
Masons—P. Coyne & Co.
Plumbers—M. & T. Chalmers.
All of Orange, N. J.

A COTTAGE (SHOWN IN APRIL NUMBER) AFTER ENLARGEMENT.

In our last issue we gave drawings, etc., of a small cottage, specially designed by Mr. Christopher Myers for future enlargement. We now represent the house as it appears after the alterations and additions have been made.

By a careful examination of the plans and elevations given in the supplementary sheet, and a comparison with those given in our last number (April), it will be seen that the object of providing a house which could be afterward enlarged without waste of material has been very successfully attained. For the purpose of comparison, the ground plans of the house, both before and after enlargement, are printed side by side on the detail sheet of this issue.

It will be observed there is practically no waste of material. All that is done is slightly to alter one wall, remove certain windows and doors and place them in new positions. All the remainder of the work consists simply of the additions necessitated by the enlargement. The sheathing and all other material is utilized in the new building, so that it may be said that there is no waste whatever.

As altered and now represented, the house would form a very desirable and convenient residence, with well arranged rooms and a pleasing elevation. The design is one which is, at the same time thoroughly economical.

Below is the specification for the alterations and additions, as well as two separate bills of materials; one for the alteration, and the other for the complete erection of the house in its form as now represented. This and our last number taken collectively, therefore, provide for (1) the erection of the smaller house, (2) the alteration and enlargement of the same, and (3) the erection of the larger house. When it is desired to erect the larger house at once, the drawings and bill of quantities will be taken from this number, and the specification (which answers for both houses) from the last, excepting that the plumber's specification, printed below, must be added.

The design was specially drawn for the SCIENTIFIC AMERICAN, and we shall be glad to give our readers any further information they may desire in respect to either house.

SPECIFICATIONS FOR THE ALTERATION AND ENLARGEMENT OF COTTAGE SHOWN IN APRIL NUMBER.

MASON'S WORK.

Excavating.—Do all necessary excavating for the cellar, depth to be 3″ lower than the present cement bottom. Excavate for all piazza piers, stoop stones, cesspool, etc., complete, and remove the earth where directed.

Stonework.—Build foundation walls as shown, with stone to match those of present foundation, laid up with good sharp sand and cement mortar, flush pointed inside and all that portion exposed to view on the outside to be pointed to match that of the other wall, the side of the old wall which will be exposed in the new part to be neatly pointed up and the wall made perfectly secure, the wall to have a footing course underneath, 4″ deep, made of grouting.

Brickwork.—Do all the brickwork as shown on the plans, the outside piers to be started on a good, solid foundation and laid up true and plumb. Build the kitchen jambs and fireplace with pressed brick, this fireplace to have a trimmer arch, and the pressed brick laid in red mortar. Furnish and lay a rubbed bluestone hearth and rubbed bluestone shelf.

Plastering.—Plaster the entire first, second, and third stories of new part, three coat work, hard finished; the closets and attic may be laid, the mortar to lie at least one week before using.

Cementing.—Cement the entire cellar bottom with Rosendale cement, at least 3″ thick, and to come even with that in the old part.

Doorway.—Cut a doorway from old to new part, smoothly done, and neatly pointed up.

Bluestone.—Put bluestone sills to all cellar windows, 3″ thick, and as smooth as the market will afford. All this work is to correspond with the work it adjoins.

Cesspool.—Build a second cesspool, same size as present one, and in the same manner; connect together with a 4″ cast iron pipe, with end turned down in existing one. This pipe is intended to carry off the liquid from first to second. These cesspools to be as close as practicable.

Cistern.—Build a second cistern, to correspond with the present one, and built in same manner. Connect these with drain tile 4″ in diameter, at bottom of cisterns. These placed as close together as practicable.

CARPENTER'S WORK.

All the work to be done in a good, substantial, and workmanlike manner, to the true intent and meaning of the plans and these specifications.

Size of Timber, etc.—Sills 3″ × 8″, first and second tier of beams 2″ × 10″, third tier 2″ × 9″. All 16″ on centers. Rafters 2″ × 6″ × 24″ on centers. All studding 2″ × 4″ × 16″ on centers.

Frame the building in the strongest manner, in accordance with the drawings. All the joints fitted together, and the frame tenoned and mortised. Extend the piazza as shown on the plans; columns, brackets, rails, etc., to match those in their immediate vicinity.

Sheathing.—Sheathe the entire building diagonally with rough hemlock boards, nailed in each and every nailing. On this sheathing lay heavy building paper, well lapped and worked under the door and window casings and corner boards.

Roofs.—Form the roofs as shown on the elevations to match with the present house. Cover the roof with slates of size and color to match those of present house, the end cornice to be taken off and used as far as it remains good.

Tinning and Flashing.—Do all necessary tinning and flashing whatsoever to gutters, valleys, piazza roofs, etc.

Shingling.—Do shingling as shown. The old shingles may be used as far as they remain sound and good, and to particularly match those on the present house.

Window Frames.—Make all necessary new window frames, corner boards, etc., the same as those in present house. Take out the old frames, and these to be used in places provided for same.

Floors.—Lay the floors of white pine, those of first and second stories to be 4½″ wide, those of attic 9½″ wide, all well driven together and blind nailed.

Doors, etc.—For number and size see plans. Those of rooms to be 1½″ thick, and those of closets 1¼″ thick. The old doors taken out and used in their respective places on new part, hung and locked complete. Hardware to correspond with that of present house. Put in sliding doors where indicated in the old wall of house, these to roll on 4″ "Hatfield's" patent sheaves, and to have astragal face sliding door locks and flush handles, stop and brass track complete.

Architraves.—Trim all the doors and windows with trimmings, jambs, stop beads, bases, etc., to match those of present house.

Shelving.—Shelve all the closets as indicated on the various floor plans; the pantry to have five shelves 14″ wide. Bed room closets to have two shelves each, and to have strips underneath; each strip to have proper quantity of wardrobe hooks screwed thereto. This shelving to be supported on rabbeted cleats.

Bath Room.—Fit up the bath room as indicated on the plans, with ash, the tub to have casing on top and ceiled on the faces; the water closet fitted up with seat and riser; seat to have hinged cover. This water closet to be put together with screws, so it can easily be taken apart by the plumber for repairs; wainscot bath room with 2½″ ash beaded ceiling, 4′ high all around, and finished on top with nosing and cove finish.

Patching.—Do all necessary patching of every description to make the job complete.

Painting.—Paint the whole of the new part with white lead and linseed oil paint. Shellac all knots. Sap before priming coat is applied. Putty up all nail holes and over nail heads, cracks, etc., of every description, after priming is done; the color to match that of the present house. The tin work and leaders to have two coats of "Prince's" metallic paint.

PLUMBER'S WORK.

Drain Pipe.—Furnish and put in where shown on the plans, a 4″ cast iron drain pipe, to run from inside of building. The drain pipe to be trapped inside of the cellar wall, and to be supplied with fresh air from the outside of the building, with iron pipe run through the foundation, and to have a perforated cover as directed by the architect. In every case use Y branches for all iron pipe connections.

Soil.—Furnish and connect with the drain in cellar a 4″ cast iron soil pipe, and run same size up and out of roof, at least 4′, and cap the same with the Smith's patented ventilating cap. Use Y branches for all waste connections. Coat the iron pipe with asphaltum, and in the cellar insert a 4″ cleaning cap.

Calking.—The joints of all iron pipes are to be thoroughly calked with oakum and molten lead, and fastened into position with iron hooks; all joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipe, and lead pipes soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on the plans a 35 gal. galvanized boiler and provide with draw cock for emptying the boiler, and shut off cocks for shutting the water off from second story, and provide for circulating pipe complete. Connect boiler draw cock with the sink waste. Put in a combined safe and vacumn valve on pipe at top of boiler. Boiler to have the Lockwood stand.

Exhaust.—Run from the highest point in hot water

pipe a ½″ lead pipe to carry same one foot above tank top, and bend over.

Pump.—Furnish and set in kitchen where shown on plans a No. 2½ Douglass horizontal double acting suction and force pump. Fig. 23, *b*, brass lined and connected to a 1¼ B lead suction pipe. Insert an air cock to prevent pipe from freezing in cold weather.

Supply.—From the pump carry a 1″ A lead pipe to enter bottom of tank, the same to act as a house supply. Place a 1″ finished stop with waste on the pipe in bath room. Provide a check valve near pumps, so that cold water over sink must be drawn by pumping. Hot and cold supply all through the house to be ⅝ A lead pipe, and all pipes are to be graded so they will drain perfectly dry. Control each floor separately by ⅝ finished stop and waste.

Sink.—To be an 18″ × 30″ galvanized iron, with two front legs, trapped with 1½″ trap and lead waste of 1½ C, connected with 2″ iron soil under floor, also insert a cleaning cap at the point. Sink to be supplied with hot and cold water through ⅝ A lead pipe and through "Peck's" improved lever handle bibbs. Flash the woodwork back of sink with 3 lb. sheet lead 15″ high.

Bath.—Furnish and put up where shown on plans or as directed a 16 oz. tinned and planished bath tub, 5½′ long, supplied with hot and cold water through ⅝ A lead pipe, and to have a nickel plated combination compress iron bath cock, with rubber hose and sprinkler. Waste through a 1½″ trap and 1½″ C lead pipe properly connected to main soil. Furnish the nickel chain and plug.

Bowl.—Furnish and set where shown on plans a 14″ patented overflow wash basin, of best Italian marble, with countersunk marble slab 22″ × 30″, and back 10″ high. Supplied with hot and cold water through ½″ A lead pipe and Peck's improved nickel plated basin cocks; to have 1¼ D lead waste pipe, trapped with a 1¼ trap and properly connected to main soil. Furnish nickel chain, plug, and fancy chain stay.

Air Chamber.—Place no cocks on end of pipe, but extend pipe at least 6″, so as to provide an air chamber.

Water Closet.—Furnish and set in bath room where shown on plans an "Inadora" all porcelain wash out closet with drip tray, also set up a painted iron cistern, with flush tank attached. Supply cistern through ⅝ A pipe from main tank. Cistern to supply closet through 1¼ D pipe. Ventilate the closet trap with a 3″ lead pipe, calked into main soil. Insert the nickel cup and pull in the seat.

Safe Pans.—The bath tub bowl and water closet are to be provided with 3 lb. lead safes turned up 2″ all around, and to have a ¾″ D waste pipe running to cellar.

Wash Trays.—Supply the wash trays with hot and cold water through ⅝″ A lead pipe, and brass tray bibbs with flange and thimble.

Provide a 1½″ lead waste, connected to main soil, and to be properly trapped. Provide necessary chains and plugs of brass.

Every trap to be placed as near fixture as possible.

Every trap in the house to be separately ventilated the same size as trap, and to either connect with main soil above bath room fixtures or run independently to 4′ above the roof line and there cap.

Range.—Furnish and put up a Newport No. 8 range and connect with boiler. The hot water pipe from range to boiler to be ¾ A.

Tank.—Line the tank as given on plans with 16 oz. tinned sheet copper, and leave complete, with overflow and inlets.

Gas Pipes.—Put up gas pipes with outlets where shown on plans, and according to the rules of the Gas Light Co. All outlets are to be capped, and all pipes tested. All side lights are to be not less than 5′ 6″ from floor. All drop lights are to be hung plumb. All the fittings for the bath room to be located as directed.

Bill of Quantities for Alteration of House.

MASON'S WORK.

		At	
70	yards excavating	$0 25	$17 50
17	perch stone work	45	76 50
	Cement bottom	..	15 00
2	piers in cellar	3 50	7 00
1	chimney breast	..	75 00
5	cellar window sills	80	4 00
375	yards plastering	40	150 00
	Additional cesspool and connection	..	25 00
	Extra drains	..	5 00
	Additional cistern, etc	..	50 00
	General patching	..	60 00
	Total		$485 00

CARPENTER'S WORK.

No. of Pieces.	Size.	Description.	
1	6″ × 8″ × 22′	=	88 feet.
2	3″ × 8″ × 13′	=	52 "
3	4″ × 6″ × 22′	=	132 "
6	4″ × 4″ × 16′	=	126 "
4	" × 13′	=	68 "
2	" × 18′	=	48 "
5	2″ × 10″ × 15′	=	125 "
52	2″ × 10″ × 13′	=	1,144 feet.
26	2″ × 9″ × 13′	=	507 "
14	2″ × 6″ × 21′	=	294 "
7	" × 16′	=	112 "
6	" × 24′	=	144 "
1	3″ × 6″ × 22′	=	33 "
1	" × 12′	=	18 "
1	" × 20′	=	30 " = 2,921 feet, per M	$28 00	$81 79
200	2″ × 4″ × 12′	=	1,600 feet, per M	24 00	38 41
550	ft. hemlock boards, put on, per M			20 00	11 00
550	" slate, per sq. ft			7	38 50
550	" hemlock sheathing, put on, per M			22 00	12 10
650	" siding, put on, per M			35 00	22 75
30	" main cornice, per ft			30	9 00
10	" band, per ft			20	2 00
30	" water table, per ft			10	3 00
50	" piazza cornice, gutter, plate, etc., per ft			30	15 00
4	columns front piazza, turned, each			2 25	10 00
35	ft. rail front piazza, per ft			30	10 50
8	brackets for front piazza, each			25	2 00
225	ft. piazza floor and ceiling, complete, per ft			25	56 25
1,000	" first and second story floors, per ft			5	50 00
500	" third story floor, complete, per ft			4	20 00
	Stoops and lattice			7 00	7 00
3	cellar windows, each			1 75	5 25
4	first story windows, complete, each			8 00	32 00
3	second story windows, complete, each			7 00	21 00
5	third story windows, complete, each			5 00	25 00
7	first story doors, complete, each			5 50	38 50
6	second story doors, complete, each			5 00	30 00
4	third story doors, complete, each			4 50	18 00
250	ft. surbase, per ft			4	10 00
5	closets, complete, each			3 00	15 00
1	pantry			12 00	12 00
	Jobbing for other trades, including tearing away old work			..	75 00
	Extra sheathing, siding paper, and sliding			..	86 80
	Incidentals			..	40 00
	Finishing square bay			..	75 00
	Total for carpenter's work				$872 85
	Painting all new work as specified				50 00
	Plumbing, without sink and extra cutting				325 00
	Range				25 00
	Furnace, complete				170 00
	Mason's work as above				485 00
	Total cost of alterations				$1,927 85

Bill of Materials for the House Complete, as Represented in the Present Issue.

CARPENTER'S WORK.

No. of Pieces.	Size.	Description.		
1	6″ × 8″ × 20′	trimmer,	=	80 feet.
1	" × 22′	"	=	88 "
3	3″ × 8″ × 12′	sills,	=	72 "
2	" × 13′	"	=	52 "
1	" × 16′	"	=	32 "
1	" × 24′	"	=	48 "
1	" × 14′	"	=	28 "
1	" × 30′	"	=	60 "
11	4″ × 6″ × 22′	post,	=	484 "
2	" × 20′	"	=	80 "
9	4″ × 4″ × 16′	plates and ties,	=	192 "
3	" × 14′	"	=	57 "
1	" × 24′	"	=	32 "
6	" × 12′	"	=	96 "
2	" × 19′	"	=	50 "
4	" × 13′	"	=	69 "
2	" × 18′	"	=	48 "
20	2″ × 10″ × 16′	beams,	=	540 "
36	" × 21′	"	=	1,260 "
5	" × 15′	"	=	125 "
52	" × 13′	"	=	1,127 "
10	2″ × 9″ × 16′	"	=	240 "
18	" × 21′	"	=	567 "
26	" × 13′	"	=	503 "
34	2″ × 6″ × 21′	rafters,	=	714 "
26	" × 16′	"	=	416 "
6	" × 18′	"	=	108 "
6	" × 24′	"	=	144 "
1	3″ × 6″ × 16′	"	=	24 "
2	" × 22′	"	=	66 "
1	" × 12′	"	=	18 "
1	" × 20′	"	=	30 "

			At	
	Equaling	7,450		
	feet spruce timber, per M		$28 00	$208 60
625	2″ × 4″ × 12′ rafters = 5,000 ft. hemlock, put up, per M		24 00	120 00
1,350	ft. hemlock boards, for roof, put on, per M		$20 00	$27 00
1,350	" slate, put on, per ft		7	94 50
2,550	" sheathing and paper, put on, per M		22 00	56 00
2,150	" siding, put on, per M		35 00	75 25
600	" shingles on sides, put on, per ft		6	36 00
230	" cornice, per ft		30	69 00
110	" band, per ft		20	22 00
160	" water table, per ft		10	16 00
100	" piazza cornice, gutter and plate, per ft		30	30 00
2	back piazza columns		..	3 00
1	short column		..	2 00
10	ft. rail balusters, back piazza per ft.		20	2 00
13	" filling, back piazza, per ft		30	3 90
6	columns, front piazza, turned, each.		2 25	13 50
1	short column		..	2 00
48	ft. rail front piazza, per ft		30	14 40
14	brackets for same, each		25	3 50
325	ft. piazza, floor, ceiling, and tin roof, per ft		25	81 25
2,800	" first and second story floors, per ft		5	140 00
1,400	" attic floor, per ft		4	56 00
	Stoops, lattice, etc		..	25 00
10	cellar windows, complete		..	17 50
17	first story windows, complete		..	136 00
14	second story windows, complete		..	98 00
9	third story windows, complete		..	45 00
	Front door, complete		..	10 00
14	first story doors, complete		..	77 00
12	second story doors, complete		..	60 00
8	third story doors, complete		4 50	36 00
2	flights stairs		..	75 00
	Cellar stairs		..	4 00
550	ft. surbase, per ft		4	22 00
1	pantry, complete		..	12 00
11	closets, complete		3 00	33 00
	Jobbing, etc., for other trades and incidentals		..	120 00
	Finishing square bay		..	75 00
	Total			$1,921 40

MASON'S WORK.

		At	
162	yds. excavating, per yd	$0 25	$40 50
60	perches stone work, each	4 50	270 00
	Cement bottom in cellar	..	30 00
4	piers in cellar	..	14 00
7	outside piers	..	21 00
2	stoop stones	..	8 00
3	chimneys	..	150 00
10	cellar window sills	..	8 00
	cellar steps and coping	..	20 50
1,100	yds. plastering	..	440 40
	Cistern, complete	..	50 00
	Cesspool, complete	..	40 00
	Drains	..	25 00
	General patching, etc	..	60 00
	Total		$1,177 40

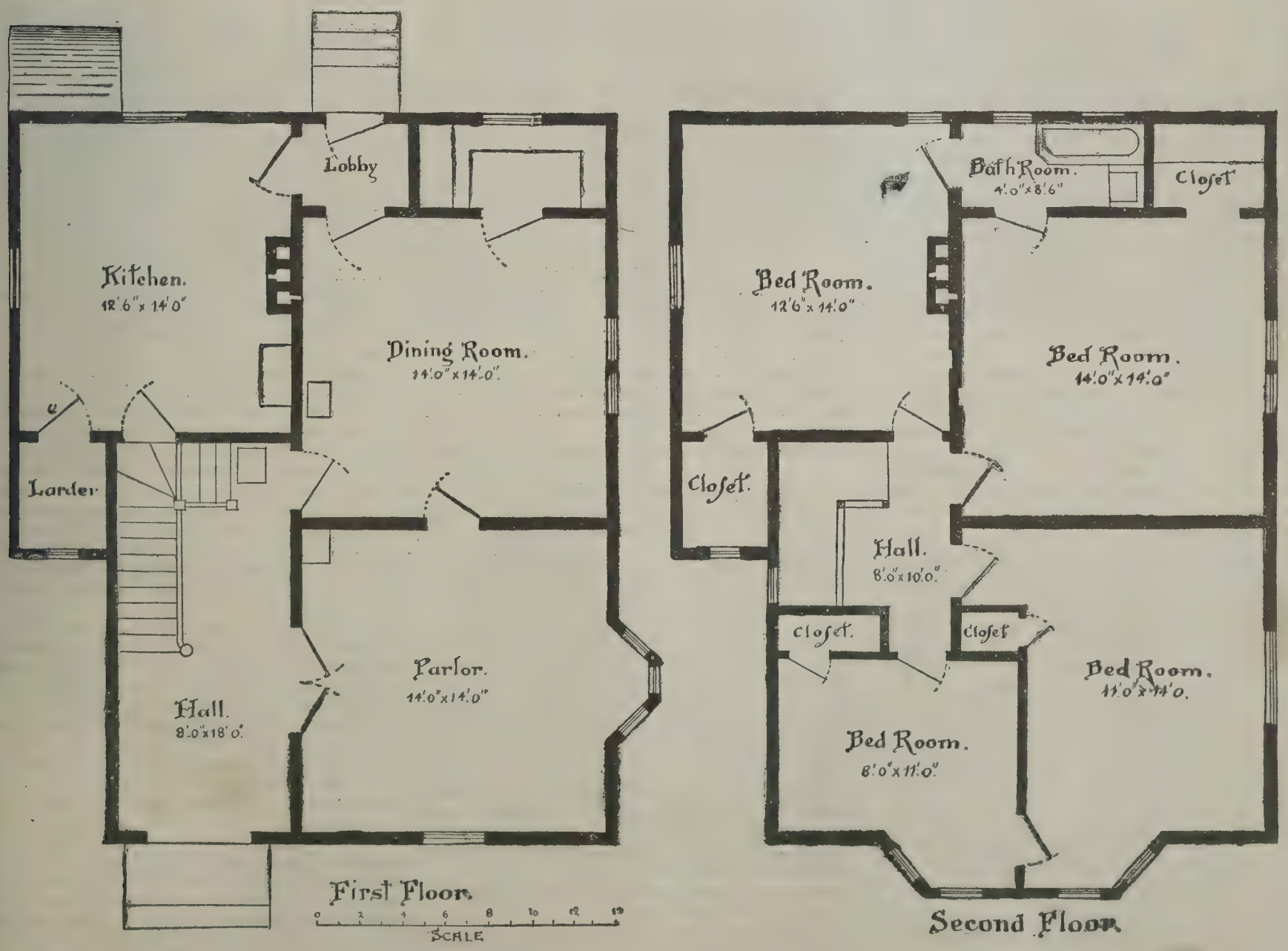
SUMMARY.

Painting	$200 00
Plumbing	320 00
Range	25 00
Furnace	170 00
Carpenter	1,921 40
Mason	1,177 40
Total cost of house	$3,813 80

Removing Paint.

When ordinary soda is exposed to the air, it has the property of absorbing, to a certain extent, the carbon anhydride from it, and especially is this so when the atmosphere is moist, the carbonic anhydride forming, with the moisture of the soda, carbonic acid. Soda being an alkaline substance, is, as we have already seen, the opposite to an acid, and when these two substances combine, a neutral salt is formed. Now, when soda is in combination with carbon, which we may often see by the whitish incrustation on its surface, or when it is in combination with any other substance, its facilities for entering into combination with a second substance are lessened to the extent of its combination with the first. This being so, we have to ask ourselves the question, How can we remove the carbon from the soda, so that it will enter more freely into combination with the oxidized oil of the paint?

Quicklime is a substance which has a greater affinity for carbon than soda. In slaking quicklime with soda, the lime enters into combination with the carbon of the soda, and by that means leaves the soda chemically uncombined with it, while it is chemically combined with the lime, forming carbonate of lime. The soda now forms a mechanical mixture with the carbonate of lime, and is ready to enter more freely into combination with the paint. The lime, or the carbonate of lime, has no action on the paint, any further than that the heat assists in driving apart more free y its molecules. The action of lime and soda on dry or wet paint is to form the whole into a soluble soap.



A TWENTY-FIVE HUNDRED DOLLAR COTTAGE.

[For description see page 100.]

A TWENTY-FIVE HUNDRED DOLLAR COTTAGE.

This convenient little dwelling was built for Mr. Amos C. Barstow, on a lot near Olney Street, Providence, R. I., under the superintendence of J. A. Bucklin, architect, of Providence. The cost, excluding a long fence, erected for the purpose of inclosing the lot, was $2,500.

SPECIFICATION AND CONTRACT.

Description.—The house is to be 23′ 6″ front, 33′ 6″ on side, with an addition 20′ 6″ × 4′ 6″ on the east side, making the rear of the house 23′, with a bay window on each story, with all the pediments, dormers, and ornaments, as shown by the drawings. The height of the stories to be as follows: The basement to be 8′ from top to top. The first story 10′ 6″ top to top. The attic story to finish 8′ in the clear between the floor and plastering. The plates on the sides are to be 4′ and on gable ends 2′ 6″ above the attic floor. Finials to be on peak and dormers.

Materials.—All the materials required to finish the contract are to be provided at the sole cost of the contractor, and to be of the kinds and qualities herein specified, but if not particularly enumerated, then they are to be of the first quality.

Works.—The contractors shall execute and perform, fully finish and complete, all the several works agreed upon as shown, indicated, or implied from designs and plans and working drawings made and to be made by James A. Bucklin, all to be done in the most workmanlike manner, under the direction and to the satisfaction of the said J. A. Bucklin as architect and superintendent of the said building.

Progress.—The building is to be immediately commenced and constantly prosecuted until completed, which shall be on or before the first day of July next ensuing.

Excavation.—The loam is to be taken off the lot the size of the house and embankments, and left in a heap where directed. The earth is to be excavated for the cellar and all foundations, drains, and cesspool, and left on the lot. All rubbish is to be carted away, and the premises left broom clean.

Cellar Walls and Foundations.—The outside cellar walls are to be built up the height to receive the brick underpinning, of good building stone, laid dry, the wall to be in no place less than 16″ thick. The underpinning to be of first quality Croton, or equal thereto, brick, the walls 8″ thick. The front and west side to be 7′ high. The east side and rear 4′ high. The cellar partition and chimney to be of first quality common brick. The top of the chimney, where seen, to be of the Croton brick, first quality. The partition walls to be 4″ thick. The cellar partition at the stairway and water closet is to be of studs lathed and plastered both sides.

Drain and Cesspool.—A cesspool 5′ diameter at the bottom and 8′ deep, built 20′ from the house, covered with a flat stone under ground, and to have 6″ drains leading from the sink and water closet pipes.

Chimney.—The chimney is to have three flues, and in each room is to have 6″ cast iron pipe collars built in. Two rooms are to have marble shelves, supported by iron brackets.

Plastering.—The whole interior of the first story and attic is to be lathed and plastered, and all overhead to be stuccoed. All sides to be skim coated suitable for paper. The laundry and cellar stairs and water closet in the cellar is to be lathed and plastered, the partitions on both sides. All the stone walls must be pointed, all the brick walls must have the joints struck smooth, and all the cellar sides and overhead must be whitewashed two coats.

Concrete.—The cellar floors are to be covered with concrete 3″ thick, composed of one part cement, one part gravel, and two parts sand, and leveled off smooth.

Timber.—All the timber is to be of spruce, of the following dimensions: sills 6×6, floor joint 2×8, placed 16″ from centers, studs 2×4, placed 16″ from centers, partitions 2×3, placed 12″ from centers, trimmers for chimneys and partitions to stand on, and stairs, 4×8, plates 6×6, girts 2×6, let into the studs, plates to partitions 4×6, rafters 3×7, placed 2′ from centers, attic ceiling joist 2×8, spiked to each rafter. All to be framed in a proper manner and fitted to both.

Boarding.—The sides, roofs, and floors are to be boarded with sound, seasoned square edged hemlock boards, planed to a thickness, laid close and well nailed, and the sides and floors to be covered with felting paper, the joints to lap 2″.

Shingles.—All the roofs and the sides of the attic story are to be shingled with first quality custom sawed cedar shingles. The pediments and sides of the addition and window caps are to be ornamental shingling, as shown by the drawings.

Tin Work.—The eaves gutters and valleys in the roofs of tin, and the four conductors, 3″ in diameter, are to be of galvanized iron.

Clapboards.—The sides of the first story are to be covered with first quality sap clear white pine clapboards, nailed with fivepenny nails, driven not over 7″ apart in each clapboard.

Dressings.—All cornices, window frames, fascias, corner and bottom boards, and other outside ornamental work are to be of sound, seasoned white pine lumber, clear of sap and large or loose knots.

Furring.—All overheads that are to be plastered are to be cross furred with 2″×1″ furs, nailed to the joist 12″ from centers.

Flooring.—The top floors of the kitchen and the kitchen and dining room closets, and the bath rooms, are to be of 3″ wide Southern hard pine boards. All other floors to be of 4″ wide spruce, all thoroughly seasoned and clear of loose or large knots, to be planed and jointed, laid in streaks, keyed up close, and well nailed and smoothed off with the smoothing plane. The outside steps and platforms are to be of seasoned 2″ white pine, the platforms of 4″ wide, tongued and grooved together. All to be clear of loose or large knots or sap. Lay single floor square edge in upper attic.

Windows.—The cellar window frames made of plank, with sash 1⅜″ thick, hung with butts, and fastened both when shut or opened, and all to be cased as directed. All other windows are to have frames with parting slips and slip boards, the sash to be 1⅜ inches thick, and to have spring fastenings of the best quality to both upper and lower sashes. All to be glazed with second quality French glass. All to have outside blinds, properly hung and fastened. The top sash of all the windows are to be glazed with colored cathedral glass. See drawings, which will show the size of light. The scuttle is to be a heavy frame, with a plate of Hammond glass, 18″×18″.

Doors.—The outside doors are to be 1¾″ thick, built in form as shown by the drawings, with top lights and colored glass, hung with 4½″ butts, and fastened with a Nashua front door mortise knob lock, with night keys and bronze knobs and escutcheons. All other doors to be 1⅜″ thick, hung with 4″ butts and fastened with a Nashua mortise knob lock.

The inside cellar doors may be good batten doors, properly hung and fastened. The trap door below the scuttle to be hung and to have weights attached. Size of trap door, 3 ft. × 4 ft. The folding doors in the front hall are to be glazed with enameled glass, and the doors in the upper and parlor halls are to be glazed with ground glass. The locks will be furnished by the owner and put on by the contractor.

Casings.—All the doors and windows are to be cased, as shown by the working drawings, with seasoned white pine, clean of large or loose knots or black sap. There is to be a roof scuttle, hung and fastened with a hook, and to have a step ladder leading to it.

Base Boards.—Base boards are to be put to all the rooms, stairs, entries, and closets. The kitchen to be ceiled up 3′ high with tongue and grooved clear white pine 3″ wide.

Stairs.—The front stairs are to be built of clear white pine lumber, as per drawings, with turned posts and balusters of ash. The cellar stairs are built under the front stairs, between plastered partitions. All turned work polished in lathe.

Closets.—The closets are to be fitted with shelves, cupboard drawers, and pins as desired, the drawers not to exceed ten in number. In the kitchen closet is to be a cupboard for a flour barrel, with a trap in the dresser. In the kitchen and laundry are to be iron sinks, with a closet under them. The bath rooms are to be finished in the usual manner, by casing the tubs and water closets, and ceiling the rooms 3′ high. All to be done with ash.

Plumbing.—There is to be furnished, and set where shown on the drawings, two water closets, one iron one in the basement and one Bartholomew in the attic. One bath tub of iron in the attic. A close-head tinned copper boiler, to hold thirty gallons, placed at the range. In the laundry and in the kitchen are to be iron sinks, with all the necessary pipes for the supply of Pawtuxet water, and all waste pipes and soil pipes leading to the sewer, and from the sewer to the roof, for ventilation; and also pipes for hot water leading from the boiler at the range to the sinks in laundry and kitchen and bath tub, with all the necessary and desired faucets and traps and other fixtures to make a complete job. All supply pipes to be of sufficient strength to sustain the pressure of the Pawtuxet water. The water will be brought into the front of the house by the owner.

Gas Pipes.—Gas pipes are to be put into the house, to all the rooms, entries, closets, and laundry and furnace room, the outlets not to exceed sixteeen in number. All the pipes to be according to the Providence Gas Co. standard.

Bells.—A bell is to be placed in the kitchen, with a bronze pull at the front door.

Painting.—All outside, except the main roof shingles, and all the inside woodwork, except floors, is to be painted two coats with white lead and linseed oil, of such colors as desired. This is to include all the ornamental shingling on the sides and pediment.

Sundries.—All cutting, casing, mending, and patching on account of plumbing, gas piping, registers, and furnace, must be done by the contractor.

Fences.—The lot is to be fenced with a board fence, planed and painted on both sides. The length to be 172′, like the other cottage.

CONTRACT.

This agreement, made this.....day of..... by and between.....of the first part, and Amos C. Barstow, of the second part, both of Providence, R. I.,

Witnesseth:

The party of the first part, in consideration of the sum of two thousand five hundred dollars, to be paid ..... by the party of the second part, hereby agree to furnish the above specified materials and labor, and build and complete a dwelling house on a lot near Olney Street, in Providence. The whole of said work is to be performed and the materials furnished in conformity with the drawings and the above specifications, which are to be considered as forming part of this contract. The said party of the first part further agrees that the work aforesaid shall be immediately commenced, and constantly prosecuted until completed, which shall be on or before the first day of July next ensuing. The party of the second part, in consideration of the materials being furnished and the work performed as above required, hereby agrees to pay to the party of the first part the sum of $2,500, in payments to be made from time to time as the work progresses, upon a certificate from the superintending architect certifying that there is fifteen per cent more of the work done and materials furnished than the whole amount received and asked for, the last payment to be made in thirty days after the whole has been completed and accepted by the superintending architect.

Embossed Wood.

To produce upon wood at moderate cost the effect of carved work has been a difficult problem, says the *Furniture Trade Review.* There are many imitations of wood carving, but every one knows at a glance that they are imitations. The texture which is peculiar to all types of wood, and which in the fancy woods is so delicate and attractive, cannot be imitated. Hence, the ornaments in plaster, papier-mache, or some of the other plastic materials have fallen short of what was aimed at, because in effect they were lifeless and abortive.

Mr. C. W. Spurr long ago learned that wood was flexible, and when he saw what an important part embossed leather was assuming in decorative art, he determined that some such treatment should be applied to wood. It was said to be impossible, because the fiber of the wood, under the great pressure necessary to emboss it, would break. After seven years of experiment, however, the tentative efforts have resulted in the most perfect embossed wood examples, which are to all intents and purposes carved upon the surface of the wood. There is the fiber of the wood in a perfect condition, while upon the surface are designs of ornament in relief which only a carver can produce. How it is done would require a scientific article to describe, although a cursory glance at the process may not be without interest.

The process of Mr. C. W. Spurr, of this city, is as follows:

An engraver produces a design from which a mould is taken and an iron die cast. The layers of wood, with the grain so arranged that any defect is supplied by the under layer, are cemented together with a backing of canvas and placed under the die in a press which has the capacity of several tons. One would expect to see the life crushed out of the wood, but as it is flexible, and as its flexibility has been calculated upon, when the press is released a beautiful panel of embossed wood is found, which is as tough and flexible as the virgin wood. The ornament may be repeated to any extent, and it is in this reproduction that the value of the discovery consists.

By means of this process one may use wood hangings as an upholsterer would tapestries. He may begin at the front door, upon which he will hang the costliest woods, and thence go into the entrance hall, and so from one apartment to another, decorating them with the richest treasures of the forest, and in the most economical manner.

It is the costliness of carving which makes it so rare; but by this process, once the design is produced and the die made for it, there is merely the cost of labor and material.

The application of this invention is unlimited and the product is invaluable wherever decorative effect is sought. For panels of bedsteads, sideboards, chiffoniers, cabinets, pianos, organs, and a thousand and one articles where attractive effects are desired, embossed wood will be in great favor. It has been said that it bears the same relation to carving that lithography does to oil painting, but it seems to us that the comparison halts, as embossed wood and carving are identical, while lithography has a distinct surface from the artist's canvas.

MATTHIAS' DESIGN FOR THE GRANT MAUSOLEUM.

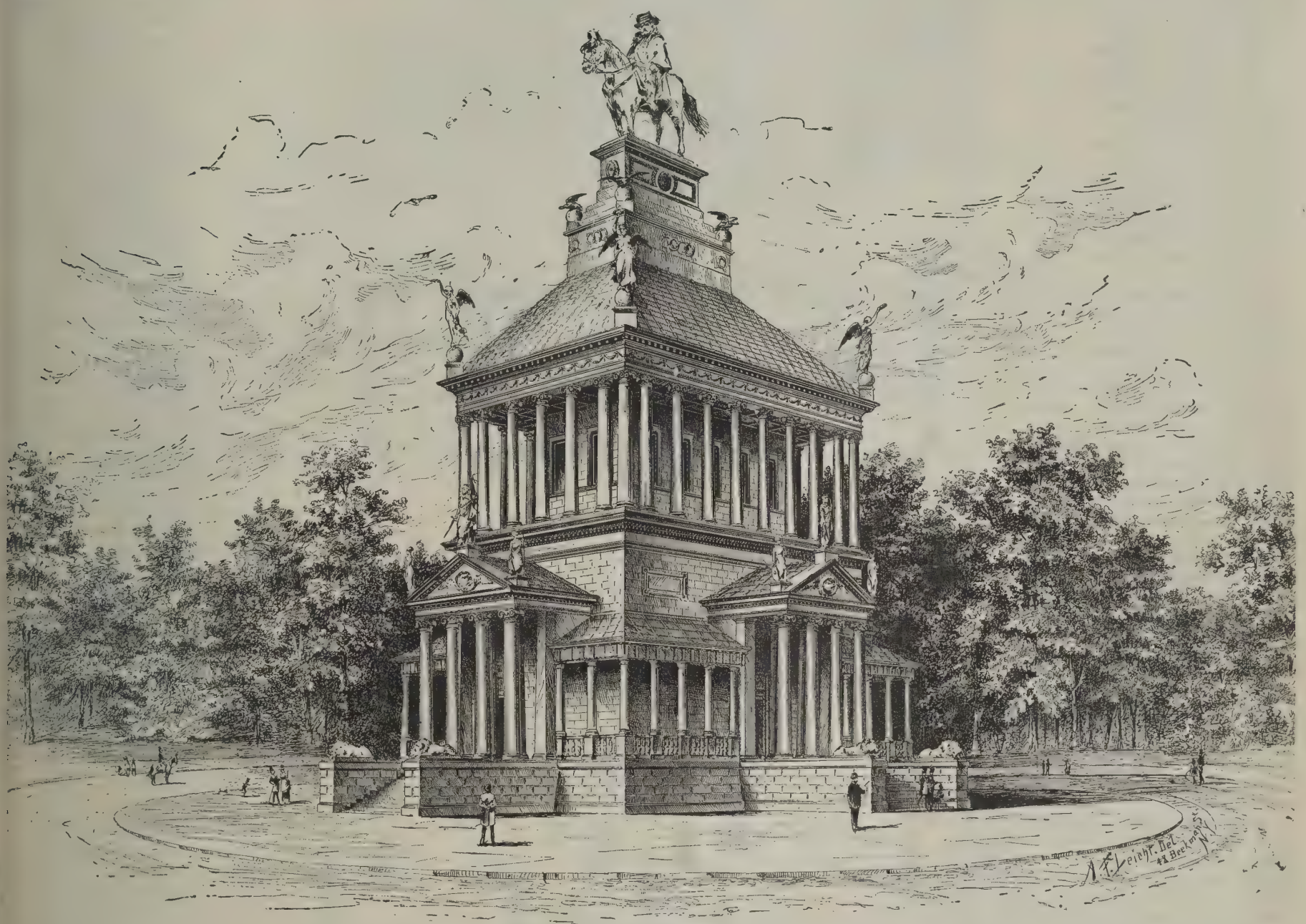
This design for a Grant mausoleum well deserving of public attention has been prepared by Mr. George Matthias, architect, of New York. Mr. Matthias has adopted for his design the Grecian form, which, for its simplicity and elegance, is unsurpassed by any other style of architecture. The total dimensions of the structure are 134 feet long, 120 feet wide, and 128 feet high. The material is intended to be granite. The main roof, as well as that of the porticoes, is also meant to be covered with granite tiles, while the statues are to be of bronze. There are four porticoes and steps leading up to them from three sides, while in the rear the steps are leading down to the vault underneath the rear end of the memorial hall.

This hall is entered through three richly paneled bronze doors, directly from the porticoes, which are connected by covered galleries. The walls and ceilings inside are to be finished in colored marble. Two sarcophagi of white marble, and a statue of the same material standing on a pedestal between them, are to be placed on a raised platform in the rear of the hall, inclosed by a railing. The figure between the sarcophagi to hold over each of them in outstretched hands a wreath of laurels. The ceiling of the hall to be laid out in richly ornamented panels. Six columns in the center of the hall carry the structure above, which is to let in the light through a stained glass skylight, worked into the marble panels of the ceiling. This latter structure supports also the pedestal, which is carried over the roof to receive a statue of General Grant. The statue is supposed to represent the great hero while making observations of the opposing army.

It seems to us that this part of the structure is excellently arranged. The statue is raised up sufficiently to be seen from the Hudson as well as from the surrounding country for many miles. The eagles at the foot of the pedestal, high up in the air, seem to be in their real element, and form an excellent feature of the design. So do the figures on the four corners of the main cornice. These statues represent the goddess of victory holding up in one hand the wreath of victory and in the other the palm of peace, thus well expressing to the popular mind what the valor of the great general accomplished for the nation. For he brought us peace and victory, the blessings which endeared him so much to the hearts of his countrymen. The figures on the porticoes represent the goddess of liberty, sword in hand, holding up the flag, while a goddess of war on each side stands ready to assist in upholding it.

Sleeping lions are placed at the four entrances, and remind the visitor, on entering the mausoleum, of the strength and courage of the great soldier who is supposed to rest beneath the walls of the edifice, intended to immortalize his deeds, which placed him foremost in the ranks of the greatest generals of all ages.

As a whole, Mr. Matthias' design compares well with others that have been brought to our notice so far, and we hope that its publication will contribute to revive the interest of the public for the contemplated monument to our dead hero.



DESIGN FOR A GRANT MAUSOLEUM RIVERSIDE PARK N.Y.

GEORGE MATTHIAS, ARCHITECT

STEWART BUILDING NEW YORK.

Knotting and Its Uses.

Knotting, as its name implies, is a thin varnish used for coating over knots in wood preparatory to painting. No doubt every one in the painting trade is familiar with the brown stains which knots produce on paint when they have not been specially prepared. Before patent knotting was known, knots were chiefly treated with red lead, mixed with a little weak size as a binding agency, or gilded with gold leaf, this latter acting as an effectual stop to the resin of the knots. Now, red lead contains a good percentage of oxygen, which is ready to enter into combination with any other oxidizable substance, It has also the property of separating from drying oils the mucilage which prevents them from entering into combination with oxygen, when applied in the form of paint. We may suppose, from the action of the resinous or oily substance which exudes from the knots of wood, that it is composed also of mucilage, which is largely present in, perhaps, nearly all vegetable substances. Such is the fact with raw linseed oil, which is boiled with red lead, litharge, manganese, etc. These have the property of separating the mucilage from the oil, which otherwise would prevent its oxidization, or drying. In this way we often find that the paint on the knots of woodwork which has been newly primed is very often wet when the other parts, that are free from the resinous substances, are quite dry.

Patent knotting is a varnish which dries by the spirit volatilizing, and leaving the shellac in a solid form on whatever substance may be coated with it. The substances the shellac is dissolved in for making patent knotting evaporate very quickly, being in fact methylated spirits of wine, or naphtha. On account of the time which it takes for the spirit to evaporate, the resin has not time to enter into solution with the shellac, as it has in the case of paint. Again, the shellac presents an insoluble barrier to the oily substance which exudes from the knots. Paint, when once dry, also forms an insoluble compound, but in the case of paint put on unprepared knots, the resinous substance enters into solution *before* the paint has time to dry.

Strength of Paris Plaster.

The extraordinary forces of adherence, etc., of the Paris plaster enables the work on ceilings or partitions to be executed with far less expense of lathing than similar works executed with our lime and hair. Rondelet made experiments to acertain the limits of these forces, and he obtained the following results. A parallelopipedon of plaster, with a base measuring one inch each way, supported a weight of 76 lb., acting so as to tear it asunder. This he called the force of adhesion. Similar figures resisted a crushing weight of 722 lb.; so that the ratio of the resistance of plaster to an effort of traction compared to one of extension is as 1 to 9½.

Rondelet found that there was a sensible difference in the manner in which plaster adhered to brick or stone, from the action of mortar under similar circumstances. For when cubes joined by the respective materials were subjected to forces tending to tear them asunder, the mortar broke through the center of the joint, leaving particles attached to the upper and under surfaces. Plaster, on the contrary, left the surfaces perfectly clean. In new works the plaster adheres to other materials with about half the force necessary to tear it asunder. Mortar, for several years at least, only attains one-third of the same force. This ratio does not continue, for after ten to twelve years the plaster loses its strength, while, at the same epoch, we find the adhesion of the mortar to other substances to be equal to the force of adhesion of the cubes themselves. The subsequent ratios are in inverse progression. Mortar always hardens by time; plaster loses strength. As these remarks only apply to its use as a mortar externally, it should never be employed permanently for such positions. Internally the loss of strength is not so rapid, for it depends upon the absorption of moisture from the atmosphere. For temporary works, for internal works, requiring great rapidity of execution, however, the use of Paris plaster is invaluable.—*G. R. Burnell.*

APARTMENT HOUSE, BROOKLYN, N. Y.

We present a second story plan and a perspective of an apartment house erected by Mrs. Mary Johnson in Quincy St. between Nostrand and Marcy Avenues, in the city of Brooklyn, at a cost of about $50,000, from plans by Amzi Hill, architect, 1161 Fulton Street, Brooklyn.

The building is 55 feet front and 95 feet deep, has a Trenton brick front with rubbed brownstone trimmings, the front of basement is of rock faced brownstone ashlar.

The balconies and cornices are of galvanized iron.

The building is heated with steam, by radiators placed in the several rooms.

The interior arrangement is probably the most perfect of any building of its size in the city.

Every room has at least one window communicating directly with the outside air and light, except the bath rooms, which are lighted and ventilated by a 5×8 feet brick walled light shaft.

Each bed room has a closet and one of Mott's folding wash basins.

The main hall is lighted by a galvanized iron skylight, 12 × 17 feet.

In the center of hall is a 5×7 feet hydraulic passenger elevator, with stairs around it.

A fireproof hall and stairs is placed at the rear of the building.

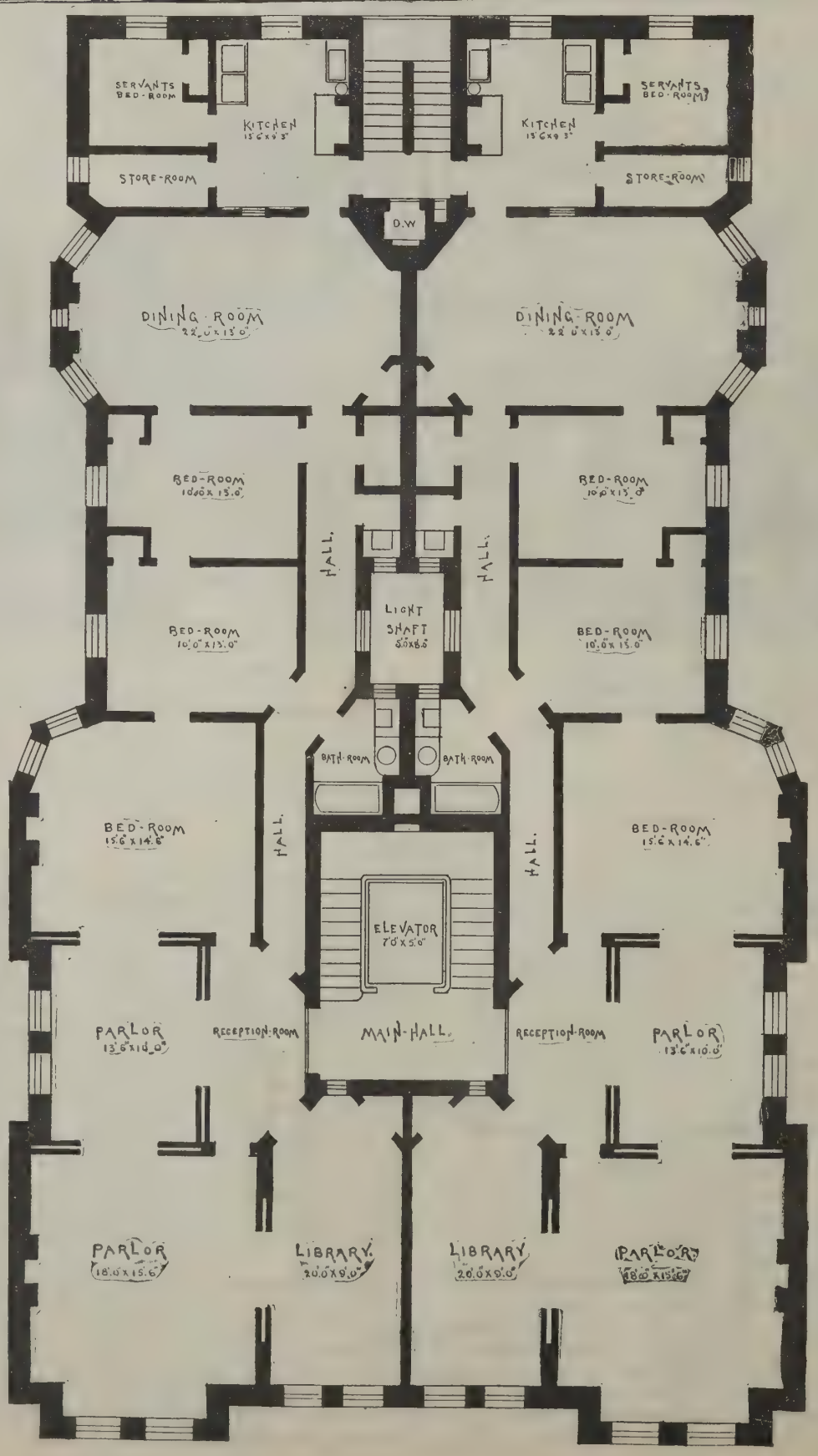
In this hall and near the kitchen doors are the dumbwaiter and ash shaft, all extending from the cellar to the roof.

At the front of each apartment three or four large rooms connect with each other by sliding doors and arches, giving ample parlor room for those who require it, or some of them can be used as bed rooms by those who need more bed rooms.

Each of these rooms connects with a reception or ante room, which is lighted by stained glass doors, and from it a private passageway leads to the dining room, bed, bath rooms, etc.

The kitchen is placed at the rear, and communicates with the rear stairway, through which the servants can go down to the yard and to Lexington Avenue, by a rear alley way, through which all the coal and all groceries, etc., are brought into the building.

NEW APARTMENT HOUSE, BROOKLYN, N. Y.



Items Relating to Paints.

For rosewood a rather red ground is required. Use vermilion and chrome yellow. Graining color, Vandyke brown and ivory black. Lay this on freely, then wipe out with a sponge, using the blender to soften. A flogger may be used to advantage. Then overgrain with black, crossing the lines of the graining in curved lines.

Binding is an important feature in quick drying paints—dead colors—to insure adhesion to the work. If paint be mixed with turpentine alone, the latter will quickly evaporate and leave nothing but the dry pigments. Oil or varnish is added to bind the paint particles together. They, unlike turpentine, form a resinous coating by absorbing oxygen in drying.

Oil of turpentine may be deprived of its penetrating odor by rectifying it over five per cent. of its weight of unslaked lime added to it in the shape of milk of lime.

Ebony can be imitated on wood by first painting with one per cent solution of sulphate of copper. When perfectly dry, the wood is painted over with a liquid consisting of equal parts of aniline hydrochloride and spirits of wine. The blue vitriol acts on the aniline and forms nigrosine, a black which cannot be affected by acids or alkalies. A luster can be imparted by coating with copal varnish.

Ground for satinwood graining is similar to that for maple, a little more yellow being added. Raw sienna and umbers, or raw sienna and Vandyke brown make good graining colors. A sponge, a mottler, and a blender are the three tools principally needed. For overgraining, the same process may be followed as in maple; the grain, however, is generally stronger in satinwood than in the others, and not so curly. Study specimens of the real wood.

To make paint dry in half an hour, mix the colors in gold size and spirits of turpentine. Let each coat dry thoroughly before the next is applied. Varnish over, to give a gloss.

A wall exposed to cold and moisture may be coated with a compound of three-quarters of a pound of soap dissolved in ten pounds of boiling water, care being taken in applying it to avoid the formation of bubbles. A little alcohol assists in dissolving the froth, and causes the solution to penetrate deeper into wall. After twenty-four hours, a second coat, composed of a solution of sulphate alumina about half a pound in thirty pounds of water is added. We used Castile soap and common alum instead of alumina on a bad wall, and its action was perfectly satisfactory. (One pound of sulphate of alumina is equal to nearly two pounds of the alum of the drug store.)

A good drying black may be made with burnt lamp black mixed with cold boiled oil, turpentine and driers. A little blue improves it.—*House Painting.*

Water Back Explosions.

During the past winter quite a number of accidents have been reported from the bursting and explosion of the water backs to ranges. Among a number of remedies suggested for obviating such occurrences, the following, by a correspondent in the *American Architect*, possesses novelty, and may answer the purpose required of it.

The device consists of an air chamber made of corrugated sheet iron, placed inside of the water back; when the water freezes, it will expand 0·089 of its bulk; and as the compressibility of air exceeds this by far, an air chamber of, say, one by two inches, in an ordinary size water back, will accomplish the object, and danger of bursting or exploding is averted, either from the expansion of ice or pressure of steam; to make sure, I have added a device in the shape of a plug placed in the top of the water back, held in its place by a spring, which will allow the plug to rise up under a certain pressure of steam, thus acting as a safety valve; when, then, the connections between the water back and boiler are made with lead pipe, instead of iron pipe, the writer adds, all danger of bursting or exploding is averted.

A TWO THOUSAND DOLLAR HOUSE.

SPECIFICATION

For a two story and attic dwelling house, designed for Mr. H. G. Bell, Rutherford, N. J., by B. J. Schweitzer, architect, No. 84 West Broadway, New York.

EXCAVATION.

Cellar.—To be under the entire house, 3 feet 6 inches deep.

Cistern.—To be 8 feet in diameter and 10 feet deep.

Cesspool.—To be 7 feet in diameter and 8 feet deep.

Privy Vault.—To be 4 feet 6 inches by 4 feet 6 inches, and 4 feet deep.

Trenches for all pipes not less than 2 feet 6 inches deep.

Grading.—Clean up the lot and grade off as directed after all other mechanics.

MASON WORK.

Cellar.—Lay up the cellar wall 16 inches thick of good quarry stone in lime and cement mortar. Above the ground build an 8 inch hard brick wall in good lime and cement mortar, and point up complete inside and outside.

Chimneys.—Build the chimneys of good hard bricks, laid in good lime and cement mortar. Strike all the joints of the flues, and put in a stove pipe hole, with collar and thimble, in each room.

Piers.—Build all piers of good hard bricks, laid in good mortar, complete.

Cistern.—Build the cistern with brick wall and arch over. Cement the inside and warrant it water tight. Connect all pipes from leaders, and also overflow pit.

Privy Vault and *Cesspool* to be stoned up dry.

Bluestone.—Furnish bluestone caps for both chimneys, and bluestone copings and steps for the outside cellar entrance.

LATHING AND PLASTERING.

All walls and ceilings on first and second floors are to be lathed with best spruce lath, and all are to be plastered two good coats of tempered mortar, and then hard finished with good finishing lime and plaster Paris.

CARPENTER WORK.

Posts 4 x 6 in., sills 4 in. x 6 in., and interties 4 x 6, all framed together, all hemlock. Floor beams 2 x 9, placed 16 in. from centers; rafters 2 x 6 and 2 x 8 in., all hemlock. All studs, 3 in. x 4 in. at openings. Brace all angles with long braces and fill in the frame and partitions with 2 x 4 in. wall strips, placed 16 in. from centers.

Sheathing.—Cover the entire frame with hemlock boards, and put on good resin-sized sheathing paper.

Siding.—Cover the first story with No. 1 narrow lap siding.

Shingles.—Cover the second story and gables with 6 in. x 16 in. sawed shingles, laid 6 in. to the weather.

Cornices and Trim.—Build all cornices of best white pine, as per drawings. Furnish and put up crestings and finials all complete. Curve the roofs over the porch and front bay window, and build all drips watertight. Build porch steps and rails complete, of white pine.

Tin.—Flash all valleys and gutters, also all chimneys, drips, etc. Cover all flat roofs with good I. C. tin complete.

Slate.—Cover all the other roofs with best Bangor slate.

Piazza.—Floor to be covered with 1¼ in. white pine flooring, with white lead in the grooves. Rear stoop floor same as piazza floor.

Leaders.—Put up ample leaders to convey all water from all gutters to cistern.

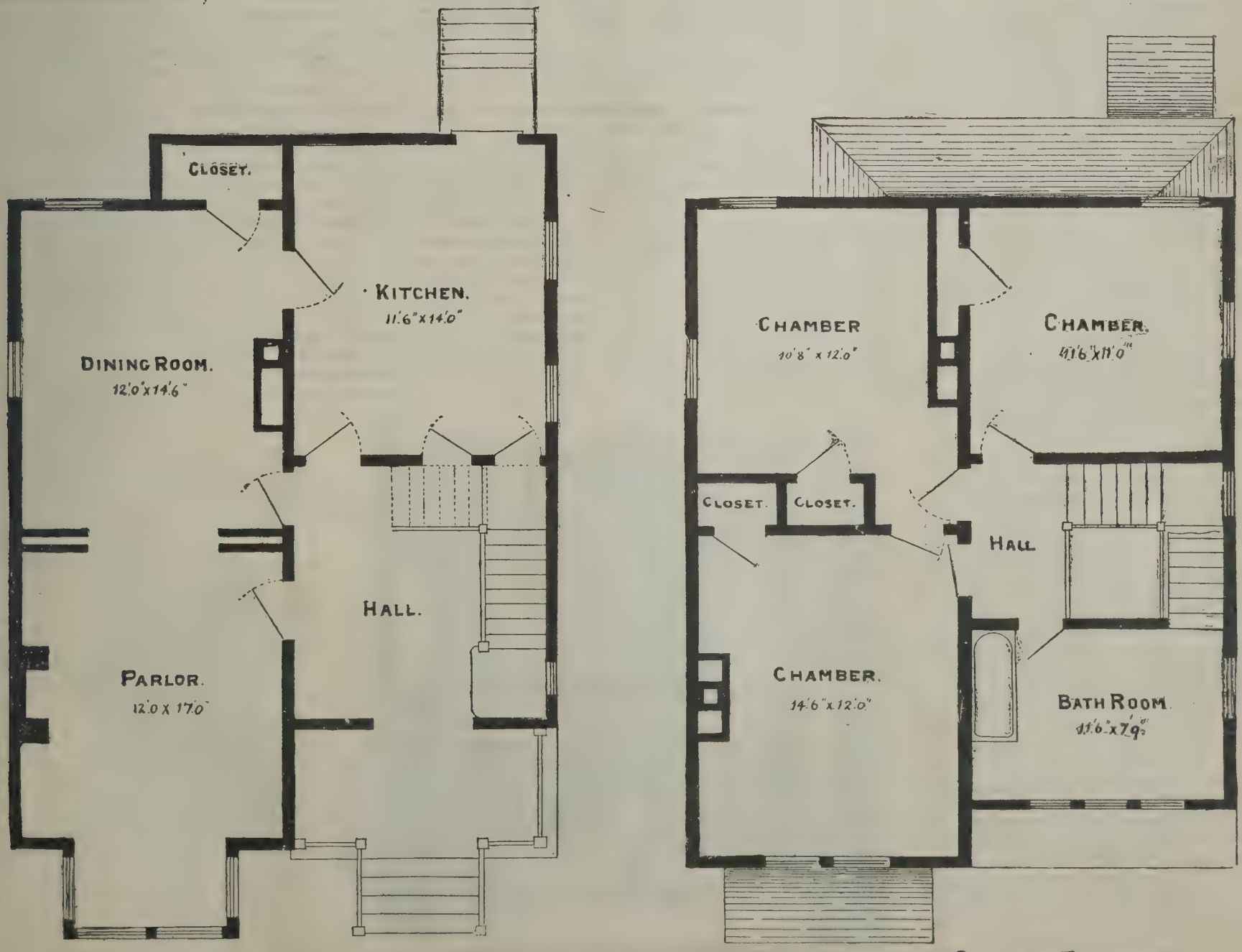
Windows.—All sashes 1½ in., glazed with French sheet glass double thick. The upper panels are to have marginal lights filled with cathedral lights. Hang all on pulleys, cords, and weights, and furnish with the "Ives" sash fastener.

Blinds.—Furnish outside blinds for all windows 1¼ in. white pine, and hang them on good New York hinges. Also provide suitable fasteners.

Doors.—Outside doors 1¾ in. thick, paneled, as per elevations, and glazed in upper panels. Hung on good hinges, 4 x 4, and furnished with latch and lock complete, with bronze furniture. Also bolts, etc. Sliding doors furnished with Prescott's hangers and flush pulls. All other doors, except closet doors, 1½ in. thick, hung on good hinges, and furnished with mortise locks and jet knobs and furniture. All closet doors 1¼ in. thick, furnished with rim locks, all complete.

Floors.—All floors are to be covered with ⅞ in. x 4½ in. white pine flooring.

Inside Trim.—All casings are to be 5 in. Queen Anne, with turned corner block. All windows to have aprons and stools. Base on first and second floors 8 in. All closets are to be shelved, and wardrobe hooks are to be furnished on second floor.



FIRST FLOOR. SECOND FLOOR.

A TWO THOUSAND DOLLAR HOUSE.

Stairs.—Build the risers of ⅞ in. white pine, treads 1¼ in. white pine, and strings 1¼ w. p. Wedge and glue together, and support the same in a proper manner, Balusters, 1¾ cherry. Newels, 7 in. on first floor and 5 in. at second and platforms. Rail, 3½ x 3½ in. Queen Anne. Attic stairs built in same manner, and inclosed.

Privy.—Build the privy over vault of ceiling boards, in usual manner, with seats, window, vent pipe, and door, all complete.

PAINTING.

Paint all metal work two good coats of Brandon metallic paint in linseed oil. Paint all shingles and other outside woodwork two best coats of white lead in linseed oil in tints to suit. Stain all inside woodwork, and varnish it two coats of No. 2 varnish, all complete and satisfactory.

FINALLY.

Do all that is necessary to finish the house in a faithful and workmanlike manner.

HEATING BY HOT WATER CIRCULATION.

It is not always easy to decide as to the proper method of warming dwellings. The best one can do is to choose that system which has the most advantages and the fewest defects. Latterly, heating by means of hot water has come into prominence, and justly so, as it presents advantages over both steam and furnace heat. In furnaces it appears almost impossible to avoid the dust that seems to be inseparable from registers, and with steam there is apt to be too much heat for mild weather.

In this connection we call attention to a new system of hot water heating, devised and patented by E. N. Gates, of Holyoke, Mass., which is simply constructed and easily managed.

In the engraving the separate boiler for each current of hot water is shown, and the direction the circulation takes, the fire under front end of boilers having given the benefit of its greatest heat to water just as it leaves the boilers, passes over bridge wall and, giving out remainder of heat to portions of boilers which are cooler, until it reaches the back end, where water enters, from return pipes, and having parted with all the heat possible, the coolest part of heated current is passed out at bottom through smoke pipe. Any number of boilers of different sizes can be arranged over the fire.

The following special advantages are claimed for this system :

1st. Over hot air furnaces.—Ability to send the heat where it is wanted, without regard to direction of wind or height of cellar, and using less fuel for amount of space heated, and freedom from dust, burnt air, and gas.

2d. Over steam, high or low pressure.—From the fact that the temperature of water in radiators can be between 70° and 212° or higher, thus adapting it to all degrees of outside temperature, making a saving in fuel and insuring even heat.

3d. Over other hot water systems.—In others the water goes to radiators from one common reservoir. Therefore, it is almost impossible to have all rooms heated alike. With this system all rooms can be heated alike, when desired, from the fact that each current is provided with an independent boiler, and as the hot water must go where the pipe leads, you have perfect control over every room.

In this apparatus, the temperature of smoke leaving the apparatus is lower than return water from the rooms, showing that full benefit is derived from all the fuel used. The apparatus is so constructed as to be entirely free of any chance of freezing and bursting, as water can be removed if the house is closed in cold weather, and the fire allowed to go out for any length of time. These hot water radiators will heat with a low fire, and will give out heat not only as long as there is any fire under the boiler, but after the fire is completely out, and until the apparatus becomes of the same temperature as the atmosphere of the room, which requires several hours. The fire pot is lined with fire brick resting on grate frame, on which rests a patented rocking grate, operated by shaking bar outside of brickwork, grinding up all clinkers, which pass into a large ash pit.

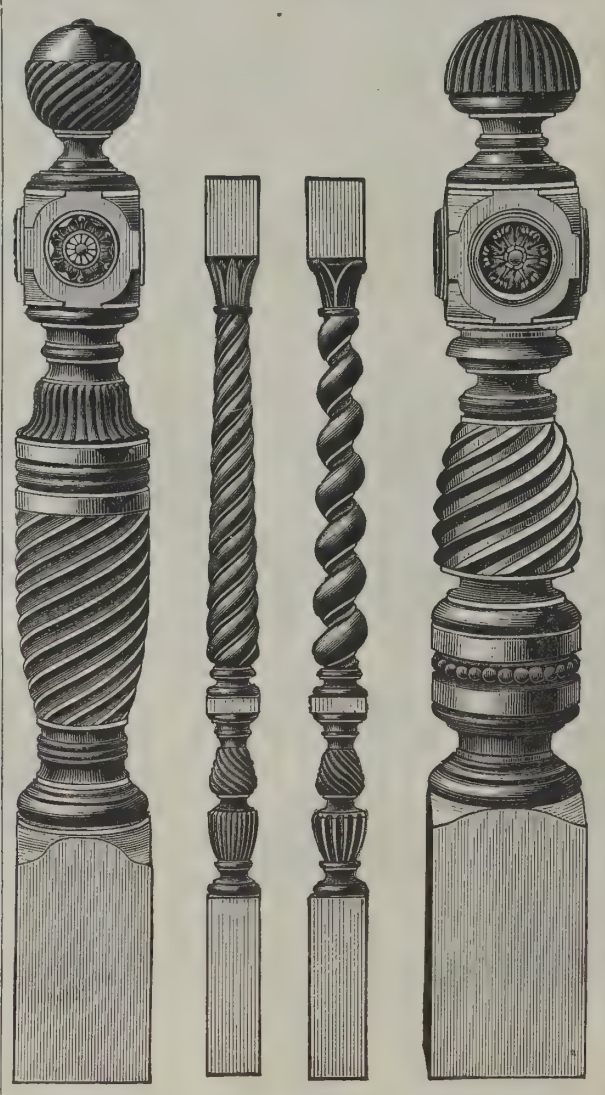
A number of these heaters have been put in operation during the last year, and are giving perfect satisfaction. The extreme cold of the past winter has thoroughly tested all kinds of apparatus. We advise any of our readers who contemplate putting in new heating apparatus, or who are not satisfied with what they have, to correspond with E. N. Gates, Holyoke, Mass., who will be pleased to send them illustrated pamphlet, describing the system in detail, and give the opinion of those who have had the system in operation.

HEATING BY HOT WATER CIRCULATION.

THE Japanese and Chinese use a cement made of rice flour mixed with water.

ARCHITECTURAL WOOD TURNING.

In this connection we show some new designs recently executed by Messrs. Anderson & Dickey, 43 Bristol Street, Boston. This firm uses only the best machinery, and several of the special machines were designed by Mr. Anderson. One of these machines enables them to twist pieces in any curve or shape desired, in sizes from one-half to twelve inches in diameter. They will be pleased to send their illustrated catalogue, showing a large line of stair posts,



newels, etc., to any address upon application. They also make a specialty of work from architects' designs.

Ready Mixed Paints.

A superior paint may be defined as one that will permanently retain its original color, and that will, for an indefinite period, resist the destroying effects of the atmosphere. Upon the first depends the good appearance of the paint, even after having been exposed for a long time to all changes of the weather, and upon the second depend the preservative qualities of the paint. It is evident that the durability of a paint, considered merely as a coating or covering for wood or metal, and not as an artistic decoration, is controlled directly by the vehicle or liquid carrying the pigment. It follows as a natural sequence that we very seldom find a mixture of a durable vehicle with an inferior pigment, as the latter by losing its color in a short time would serve to condemn the paint; the same remark applies to the combination of a superior pigment with a poor vehicle. It may therefore be considered a safe and general rule to avoid those paints which may be said to "wash off," and also those which fade, as all of the ingredients in both cases are certainly inferior. The contrary to this is also true, and a paint that will either hold its color, or remain where placed for a long time, is composed of the best materials, as it would be an exceedingly foolish proceeding on the part of a manufacturer to give his paint one good characteristic and not the other, especially when both are absolutely necessary.

It is a simple matter for any one to satisfy himself in regard to these points. In almost any neighborhood, two houses may be selected which have been painted three or four years. One appears dingy and dirty, and it is impossible to tell what the original color was, while a closer examination shows that the paint has disappeared so thoroughly and effectually as almost to make the grain of the wood discernible. In this case both pigment and vehicle were poor. In the second house, the paint, wherever it has not been discolored by dust, retains its color perfectly, and a near inspection shows that but little has been worn off. Each ingredient in this instance was of the best quality.

It requires unusual skill and experience even for the manufacturer to tell by examination whether a given paint with which he is not familiar is first class in every respect, and ninety-nine out of every hundred consumers are compelled to rely solely upon the reputation and standing of the firms they buy from. There is no quick way of practically ascertaining the wearing qualities of a paint, they cannot subject a sample to an exposure to the weather for four or five years, and yet there is no simple or shorter method of finding what they want. A paint recommended because of only one excellent point should be viewed with suspicion—that is, a paint for which only a good body is claimed, or in which only the colors are warranted fast, should be avoided.

The present plan of marketing ready mixed paints is far more reliable in every way than the old method, since it leaves no operation to be performed by the unskilled consumer or local dealer. The paint as it now leaves the works is ready for immediate use, and it is natural to assume that it will prove to be better, as every step in its preparation has been benefited by the skill and long experience of the manufacturer; this also places the responsibility upon the producer. The painter or dealer now has nothing to do with the making of the article he uses or sells, the days of the "little mill" having passed away. One of the most important advantages resulting from this is the uniformity attained in the color and quality, and the ease with which colors may be exactly duplicated; another advantage is in the lessened cost to the consumer, as improved machinery takes the place of hand labor in the mixing.

One of the oldest paint manufacturers i this country is the firm of Chas. M. Childs & Co., of 225 Pearl Street, this city. This firm has been doing an extensive business for more than a third of a century, and during all that time there has been *no complaint touching the quality of these paints.* For the past fifteen years they have been engaged largely in the production of dry colors. This fact gives them a positive advantage, as it personally acquaints them with the peculiar features of every ingredient they use, and enables them to confidently place the standard of their products. At Tuxedo Park the colors from these works entered into all the paints used.

As a result of the immense increase in the consumption of ready mixed paints, they have turned their attention to that branch of the business, and have, consequently, procured the latest and most improved machinery. Their long experience and familiarity with all pigments enable them to turn out, as they claim, paints of superior quality, while the location of their works in South Brooklyn near the Atlantic Basin gives them all the advantages to be derived from cheap transportation of all raw materials and of the finished products.

This firm will, if they receive an idea of the colors wanted, furnish such shades as will be sure to be pleasing to the eye and will agree with the conceptions of the owners or builders. When necessary, they will endeavor to fill orders given descriptively of any colors desired, and will undertake to match precisely any sample that may be sent them. The specimen cards of colors they send upon application have been found by architects to be extremely useful, by giving them harmonious combinations, and thereby allowing them to present their ideas in a more complete and finished form to their clients. These paints have been used by and are strongly recommended by the celebrated architects Bruce Price and H. Edwards Ficken.

LAKE Tahoe is to be used to irrigate lands in Nevada.

A NEW RULER AND SECTION LINER.

In all descriptions of mechanical drawing, an instrument by which lines may be readily drawn at any desired distance apart is a very valuable adjunct. Various appliances for the purpose have been invented from time to time, few of which are as complete or serviceable as that lately brought out by Messrs. Frost & Adams, of No. 37 Cornhill, Boston, Mass., under the title of the "Universal Ruler and Section Liner." An idea of the general form of the instrument may be gained from our engraving in Fig. 1, while Fig. 2 will illustrate a few of the principal uses to which it may be applied, this cut having been drawn with the ruler.

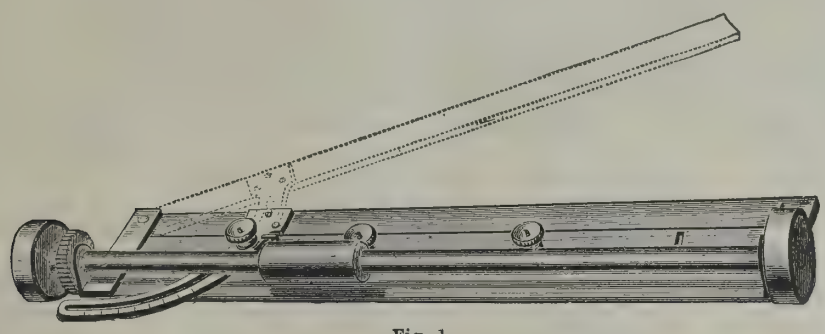


Fig. 1.

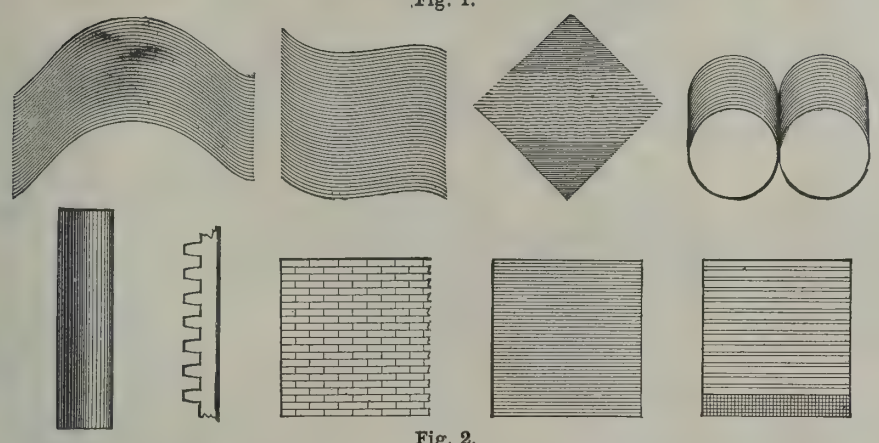


Fig. 2.

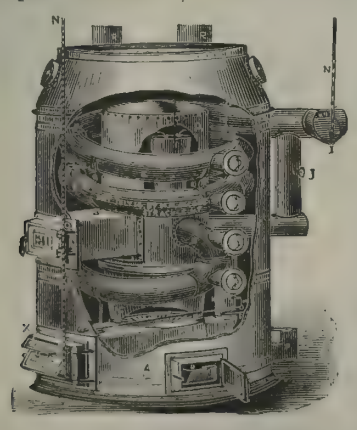
FROST & ADAMS' NEW RULER AND SECTION LINER.

The instrument may be used for drawing lines in any direction and at any distance apart, from one one-hundredth of an inch to any distance desired. In drawing parallel lines, the draughtsman places the ruler in the required position, and rules the first line. He then turns the shaft of the instrument toward him, by means of a rubber sleeve placed upon it, until he hears a click of the ratchet wheel, which is fixed upon the end of the shaft, and he then turns the shaft back a little until it stops. All the teeth of the ratchet are exactly equal, and the distance traveled by the wheels over the paper is always the same from one click to the next. When the lines are required at greater distances apart, the shaft may be turned to give two or more clicks. If they are required nearer together, the pivoted arm is fixed at an angle by means of the thumb nut and slotted quadrant, as indicated by dotted lines in the figure. For curved work, the ordinary French curve is attached to the ruler by means of the two thumb nuts in the center of the ruler plate, the lines being drawn with a right line pen, using the curve as a ruling edge.

In addition to the uses mentioned, this instrument may be employed for irregular lining and shading, setting out the spokes of wheels and teeth of bevel gears, shading cylinders, spiral springs, and screw threads. It is handsomely finished in steel and nickel plated brass, and will be found to quickly repay its cost, if only by the time it saves.

THE M. H. JACOBS CO.'S FURNACE.

With the large number of warm air and other furnaces now upon the market, those manufactured by the above named company, of No. 96 West Fayette Street, Syracuse, N. Y., bear very favorable comparison. The arrangement of the details, and the strength and durability of the parts, render the furnace a most economical and serviceable one.



The general construction will be understood on reference to the annexed sketch, in which A represents the exterior casing, B the ash pit, C the fire pot, D the dome, and E the spiral radiator tube proceeding from the cast iron duct, G, in the lower part of the dome, and having its exit in the chimney flue, F. A shield, T, compels the flame and products of combustion to ascend to the top of the dome, by which they are deflected downward into the interior of the shield, as indicated by the arrows, thus causing the dome, and hence the radiators, to be thoroughly heated.

The advantages of such a system of construction are sufficiently obvious. A full description of the furnaces, which are made in five different sizes, may be had on application to the manufacturers.

THE GATE CITY STONE FILTER.

This filter consists essentially of two parts—an upper jar or chamber supported by a lower jar. The bottom of the upper jar is composed of a filtering disk, through which the water slowly finds its way to the chamber below. The filtering medium is a natural stone, having characteristics that perfectly adapt it for this work. The impurities in the water placed in the upper jar never penetrate the stone, but lie on the surface, so that the interior of the stone remains as pure and white after years of use as when taken from the mine. This feature insures the easy cleaning of the filter, as, by means of a brush and water all the impurities that have lodged upon the surface of the disk can be thoroughly removed, thereby restoring the filter to its original condition. Within the lower jar is placed an ice chamber, which is covered by a cap, so that there is no possibility of the filtered water being contaminated by any impurities that may be in the ice.

Every part of the filter can be easily gotten at for the purpose of cleansing; the disk is an efficient purifier, permits the water to pass slowly, and does not receive into its pores the impurities it extracts; the filter, considered as a whole, will last indefinitely; and there are no metals used in its construction. The filters are made of either china, glass, or brownstone ware, in sizes varying from the traveler's portable china filter, which will purify a pint of water every two hours, up to those filtering twenty gallons per day. Physicians, chemists, and others who have used these filters recommend them as being in every way efficient and reliable.

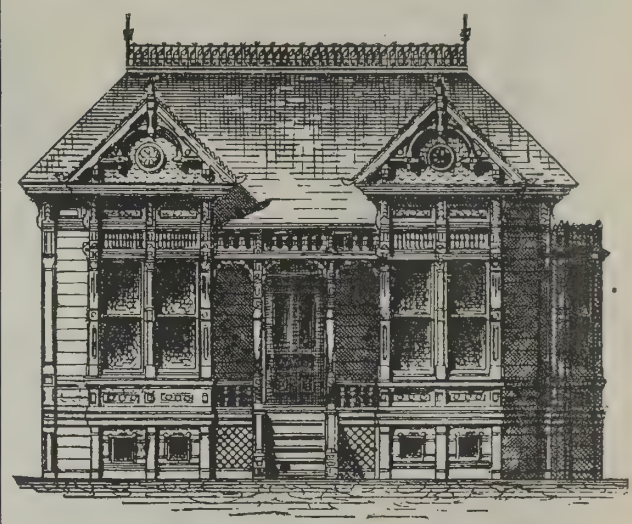
All further particulars can be had by addressing the Gate City Stone Filter Co., of 839 Broadway and 63 E. 13th Street, New York City.

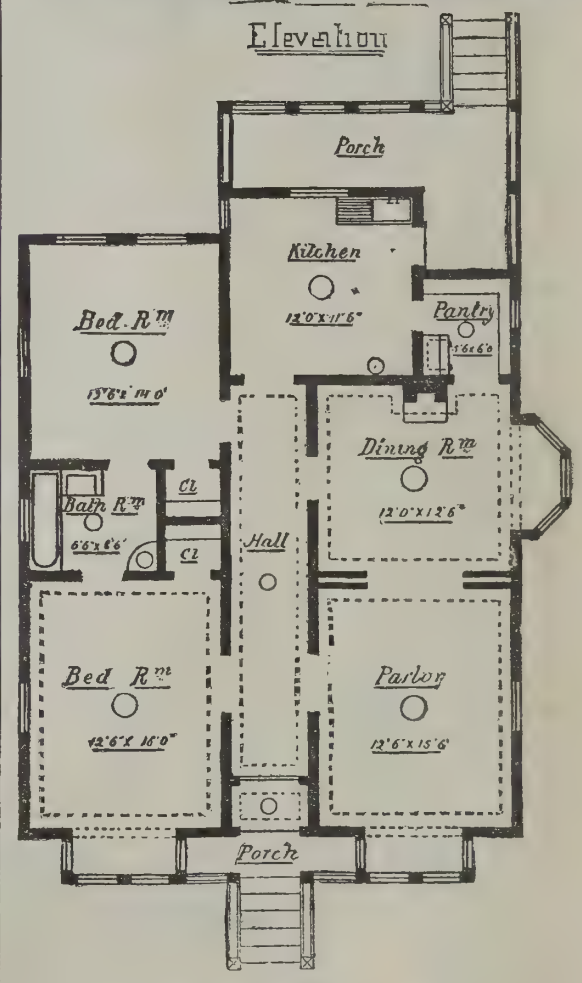
AN EASTLAKE COTTAGE.

In presenting this design, attention is called to the compactness and beauty of arrangement of plans, well proportioned rooms, no unnecessary waste of space occupied by long, gloomy halls, and each door and window having its distinct purpose or cause.

The design, as illustrated, is a model of compactness and arrangement. On entering the hall from the vestibule, the parlor and dining room are situated on the right, separated by a neatly designed, paneled sliding door, and each room having a large bay window, with an ornamental arch. On the left of the hall are entrances to two bed rooms, with a bath room between them, and each room provided with a large closet with shelves, drawers, hooks, etc., usually found in closets.

The bath room contains a wash stand with nickel plated bibbs, and a Golden Gate plug water closet, finished in black walnut and nickel plated trimmings. The bath tub is provided with hot and cold water, through nickel plated bibbs, with attached soap cups.





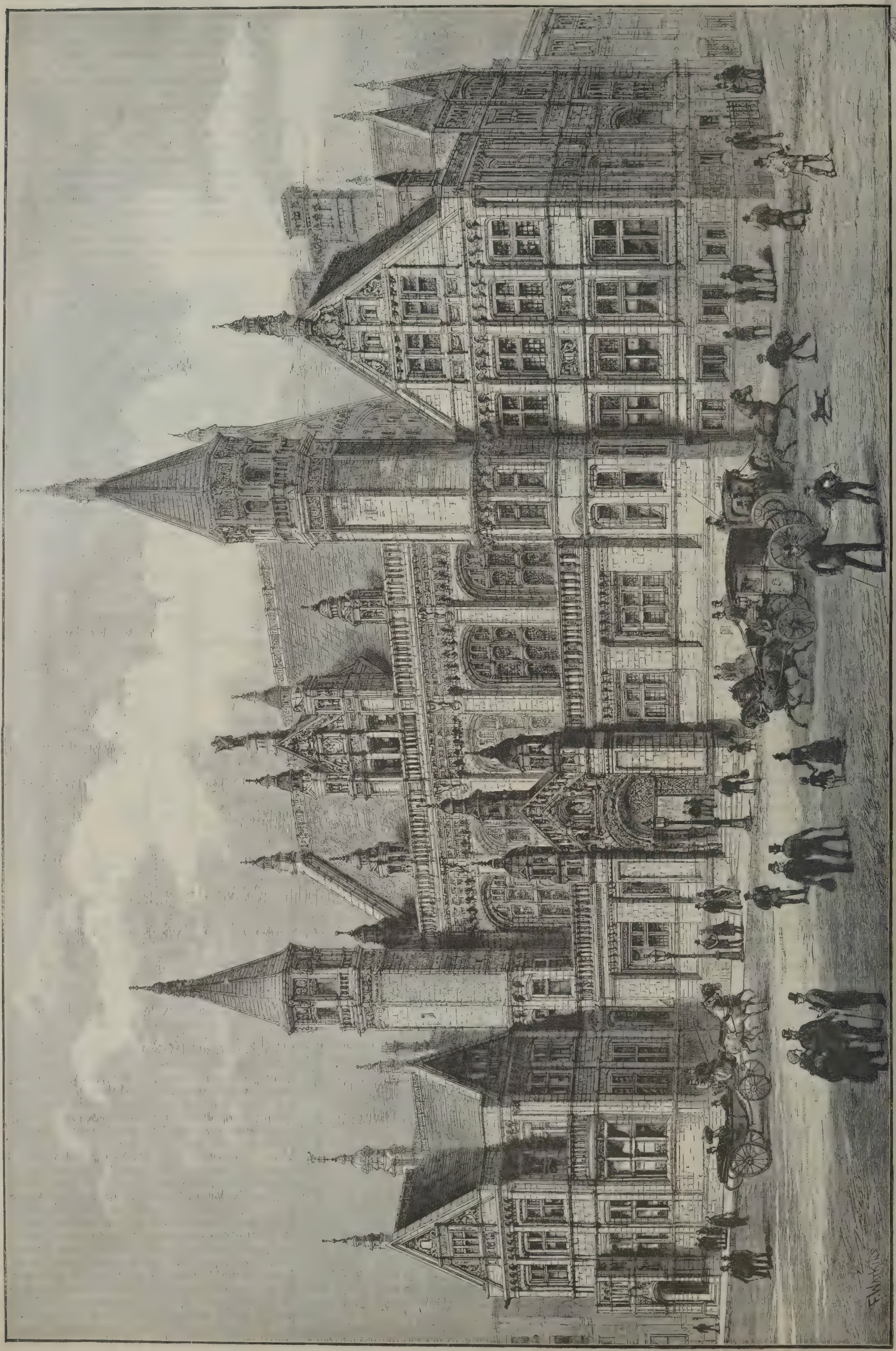
AN EASTLAKE COTTAGE.

The room is wainscoted five feet high and finished with moulded cap and paste board.

The floor should be covered with linoleum, giving the room a neat appearance, and making it easy to clean. The kitchen is provided with a sink, boiler, and a large paste pantry; and a commodious rear porch, inclosed by posts and railings, affords a good place to do washing, cleaning, etc.

The dining room is finished with paneled wainscoting, and all the woodwork finished in oak and highly polished. The dining room should be papered with some neat floral design, and the floor covered with a carpet harmonizing with the rest of the furniture.

The windows are furnished with sliding blinds, which slide in the casing, thus preventing the tearing of curtains and lambrequins. One chimney suffices for a fireplace for the dining room, and a separate flue for the kitchen. The elevation is of Eastlake style, and needs very little description, as a glance will show that it is neat in design, and solidly constructed. The roof is covered with the best quality of redwood shingles, laid four and a half inches to the weather, and well nailed. —*David Salfield, architect, Cal. Arch. and Build. News.*



THE NEW LAW COURTS, BIRMINGHAM.—ASTON WEBB AND INGRESS BELL, ARCHITECTS.—[For description see page 96.]

LOCAL BOARD OFFICES.

The illustration shows the design submitted in a recent competition for new local board offices to be erected at Brighouse. The building was proposed to be of stone from the local quarries, that to the main front being of ashlar, both to the plain wall surfaces and moulded work. The accommodation on the ground floor includes clerks' office, general rental office, committee room, waiting room, strong room, and lavatory, etc.; on the first floor, a board room, committee and waiting or ante room, lavatories, and book rooms. The front elevation was designed to harmonize with the adjoining building, belonging to the Halifax Commercial Banking Co., which building was designed and carried out under the superintendence of Mr. Geo. Hepworth, architect, Brighouse, by whom also the design for the building illustrated was prepared.—*The Architect.*

Wood Drying Experiments.

A very interesting series of experiments to determine the fluctuations of moisture in various woods during seasoning has just been closed, says the *Railway Review*, on the Chicago, Burlington & Quincy Railway, at the Aurora shops. The experiments are being continued, but the first series, the results of which we give herewith, ended in February, having been commenced December 21, 1885. The prime object of this work was to discover the laws of seasoning, if such laws existed, and thus to ascertain in what months the greatest amount of seasoning takes place, and whether wood thus seasoned reabsorbed moisture during the wet months of the fall and winter.

The work was undertaken in a very systematic way, and was done about in this wise: Three pieces of rough dressed oak, ash, and Norway pine, thoroughly green, were piled loosely, with cleats between, with a board overtopping all, in a situation where they were protected against drip and direct rain, but where they were open to rain, snow, and the sun on their sides. The conditions were, as nearly as possible, those to which lumber piled for outdoor seasoning is usually subject.

The seasoning, that is, the loss of moisture, began practically February 15, with all three woods, and ended August 2 with the ash and pine, but with the oak, October 11 seems to have been the finish.

The results with the oak were not altogether satisfactory to the experimenters. The second series of experiments will, it is hoped, throw more light upon this kind of wood.

From February 15 to August 2 the ash dropped from 29 to 12½ per cent, a loss of 16½ per cent. From August 2 to its finish, December 20, the fluctuations were between 12 and 14 per cent, the exact average being 13 27 per cent.

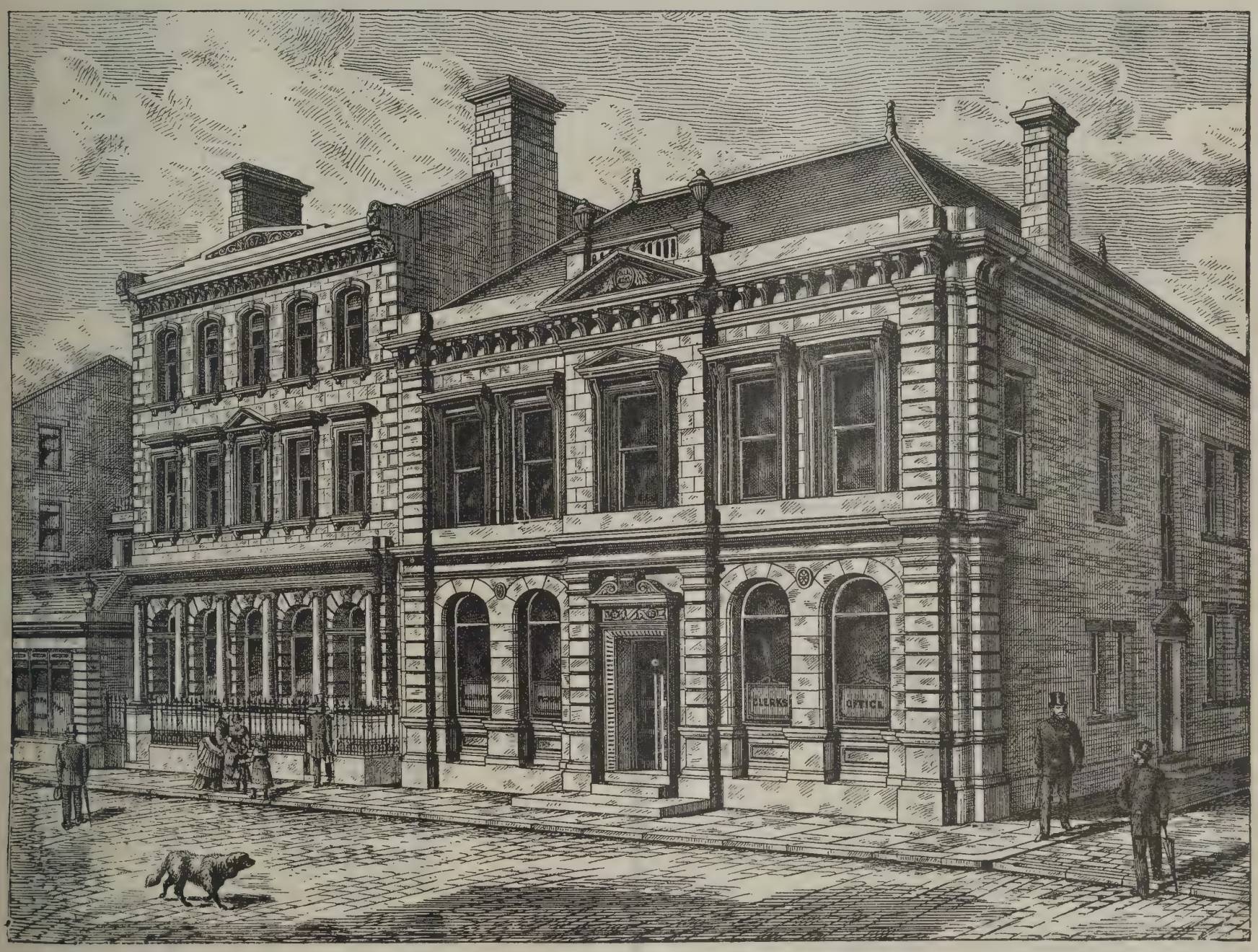
From February 15 to August 2 the pine dropped from 24 to 12½ per cent., a loss of 11½ per cent. From August 2 to its finish, February 28, its fluctuations were between 12½ and 15½ per cent. From October 25, 1886, to February 28, the exact extremes were 14·10 and 14·92 per cent, a difference of only 0·82 per cent. The extreme fortnightly fluctuation was 0·51 per cent. The average fluctuation was 0·30 per cent. The average moisture for that period was exactly 14·50 per cent.

These experiments cannot be taken at present as supplying infallible data, but in a general way it may be said that they lead to the conclusion that as regards oak, ash, and pine woods in a green condition, seasoning begins in very early spring (depending of course largely upon the kind of weather), and ends in midsummer. The provisional limits of this drying season may be fixed at the first of March to the first of August, in other words, including the months of March, April, May, June, and July. It has also been shown that, as regards ash and pine, after seasoning is effected, the wood will not take back water—that is, not beyond slight amounts during the wet and cold seasons. These conclusions are true only for the inmost parts of the woods in question, and of the sizes experimented upon. Variation in the character of the wood, condition at the time of cutting down the tree, treatment between that time and the first time of testing, sizes of pieces, etc., may alter the conclusions, although probably they would not materially do so.

The data which has been gathered in this way can be used to material advantage in many ways, notably, however, as an aid in the purchase of cars and in the purchase of timber. With the exact knowledge that it affords of the seasoning properties of different woods, and of the months during which seasoning is liable to be hastened or hindered, the guesswork of sellers of lumber and makers of cars can be readily checked.

Shrinking of Seasoned Timber.

The various kinds of oak, and some other kinds of timber, will shrink more or less every time the surface is dressed off, even a small fraction of an inch. Wheelwrights accustomed to the work are well aware of this fact, and a correct appreciation of it enables them to turn out work of a superior character, even of ordinary materials, by first blocking up the pieces roughly, then allowing the timber to season, and afterward working the various parts by degrees, as the seasoning process becomes more and more complete. White oak spoke timber, for example, may be allowed to remain in its rough state for half a score of years under shelter, without becoming seasoned so thoroughly that the timber will not shrink after the spokes have been dressed out. Carriage wheels have often been made of the choicest quality of oak timber, after every spoke has been seasoned for several years, and, to the great surprise of the wheelwright, every spoke would work in the joints before the vehicle had run three months. The defect in such instances could not be attributed to inferior timber, nor to perfunctory workmanship, but simply to this one circumstance—that the parts of the wheel were put together before the timber had ceased to shrink. To prove that the best quality of oak will shrink after a spoke has been dressed out, let a tenon be made on one end, and be driven immediately into a mortise. After a few days' exposure in a warm workshop, the spokes may be withdrawn with little difficulty. The same fact will hold good in the manufacture of woodwork of any kind where oak is employed for tenons. In order to make joints that will never start, the piece on which the tenons are made should be dressed several times, until the shrinking has ceased. Then let the tenons be made. After these have shrunk, while exposed to the drying influence of a warm workshop, the spokes or other parts may be driven in their respective places, with the assurance, especially if they are dipped in oil paint previous to driving, that the timber will shrink no more.—*The Woodworker.*



DESIGN FOR LOCAL BOARD OFFICES.—GEORGE HEPWORTH, ARCHITECT.

THE new boring at the Channel tunnel works at Dover has now reached a depth of 500 feet, and the operations, which are made with a view to ascertain whether the geological strata conform with those of the French coast, are being continued. No coal has yet been found, and the discovery of this is stated to be one of the objects of the boring.

A DOUBLE HOUSE OF MODERATE COST.

These dwellings were erected at Buttonwood, R. I., from the designs of C. F. Wilcox, architect, at a cost of $5,000.

SPECIFICATION.

Generally.—Execute the whole of the work in a good, sound, and workmanlike manner, with the best materials of their several kinds, to the entire satisfaction of the architect. Completely finish the house, in all respects, ready for occupation, and leave the same broom clean, with all rubbish cleared away.

MASON.

Excavate for cellar under kitchen to a depth of 6′ 6″ in the clear. Build water closet with raised cover for urinal.

Foundation Wall and Piers.—To be erected in Potter's best brick, 8″×16″ under sills of the house, and 8″×8″ under piazza posts, with stone foundation 2′ under the ground.

Chimneys.—To be built as indicated on plans. All flues to be pargetted and plastered externally up to roof line. Flashings of 3 lb. lead to be placed around chimneys, and a clay pipe collar in kitchen and dining room.

Cesspool.—Form a cesspool 3′ in diameter and 5′ deep for waste from kitchen sink, and lay at a depth of not less than 2′ 6″ a 6″ clay drain pipe to same. Form manhole and cover with flat stone. A dry well to be provided under basin in front hall.

Cistern of a capacity of 6,000 gallons to be provided with a 4″ drain pipe from conductor.

Plastering.—All walls and ceilings to be lathed with spruce lath and plastered one coat of brown mortar, ceilings hard finished and walls same finish.

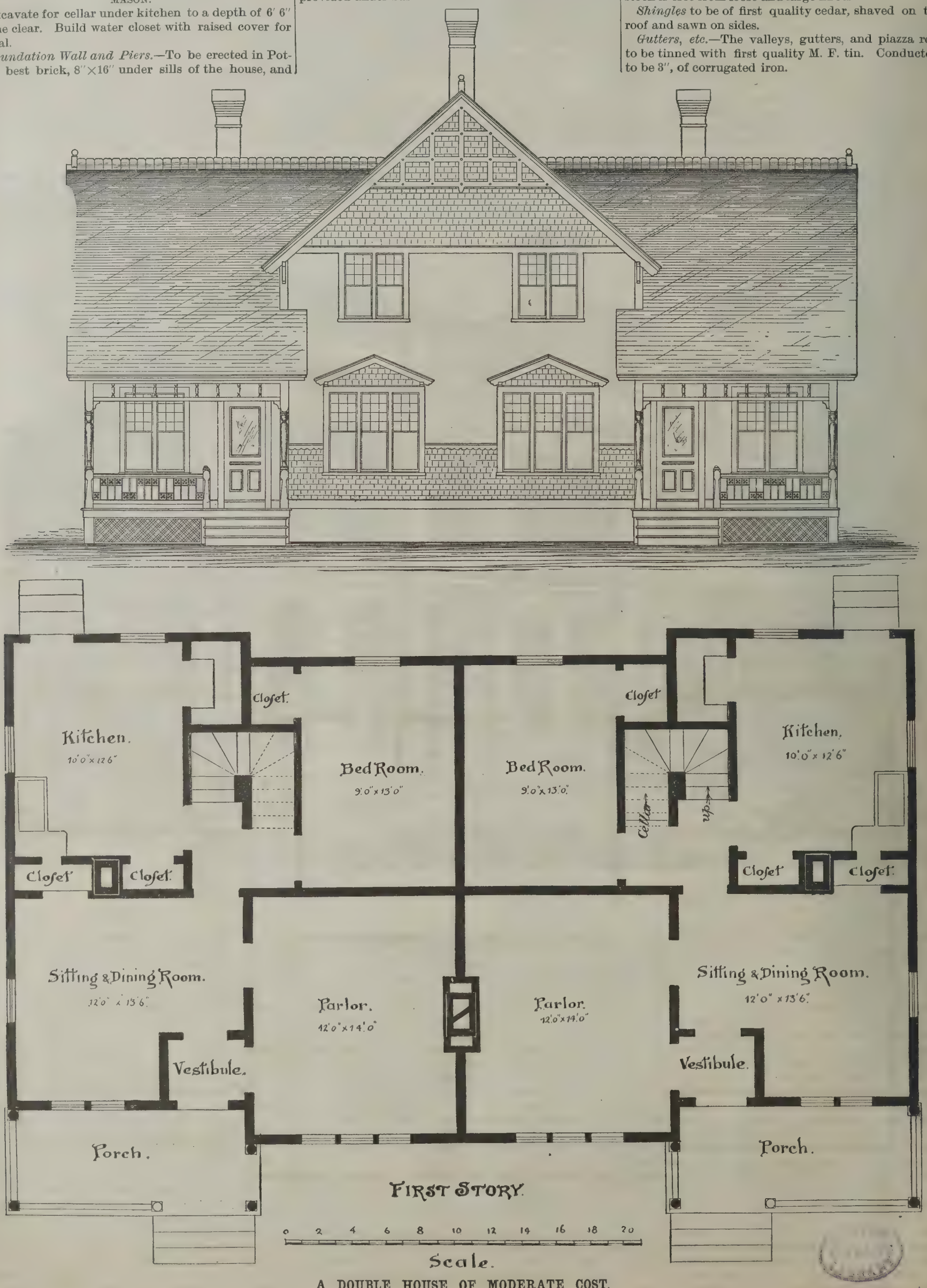
Cellar Steps to be of bluestone with brick risers.

CARPENTER.

Frame of house to be of best well seasoned spruce timber, boarded with hemlock. Trimmings and clapboards of first quality pine. Soffits and other parts not exposed to the weather may be of second quality stock if free from loose and large knots.

Shingles to be of first quality cedar, shaved on the roof and sawn on sides.

Gutters, etc.—The valleys, gutters, and piazza roof to be tinned with first quality M. F. tin. Conductors to be 3″, of corrugated iron.



A DOUBLE HOUSE OF MODERATE COST.

Sashes and Doors.—The sashes, blinds, and doors to be as shown on drawings. Sashes and doors 1⅜″ thick. Outside doors 1¾″. Mortise locks and latches to doors, with white porcelain knobs inside; bronze to outside front door and door bell, and dark mineral to back doors. The front entrance door is to be hung in two parts rabetted together and with a bolt to fasten them.

Floors throughout the house to be of spruce, excepting in kitchen, servants' bed room, and closets, which are to be of hard pine. Piazza and balcony floors, 1⅛″ matched hard pine. Ceiling over piazzas and balcony to be of matched and beaded pine.

Casings to doors and windows 4″ moulded, and baseboards 6″, with base on top edge.

Clothes Presses to be fitted with wardrobe locks and a shelf in each.

Stairs to be built with returned nosings, and to have 3″ ash rail, 1¾″ balusters, and 4″ posts.

Wash Bowl.—Fit up around wash bowl a cabinet with recessed door beneath, and provide a marbleized bowl connected by lead waste to dry well beneath. Put on marble top with back and ends.

Sink.—Fit a 3′ iron sink in kitchen, with a pump from well, and waste to drain pipe leading to cesspool.

Lattice.—Provide and fit around wash yard a lattice fence constructed of chestnut posts, pine strings and lattice. Fit lattice also under sills of house and piazza.

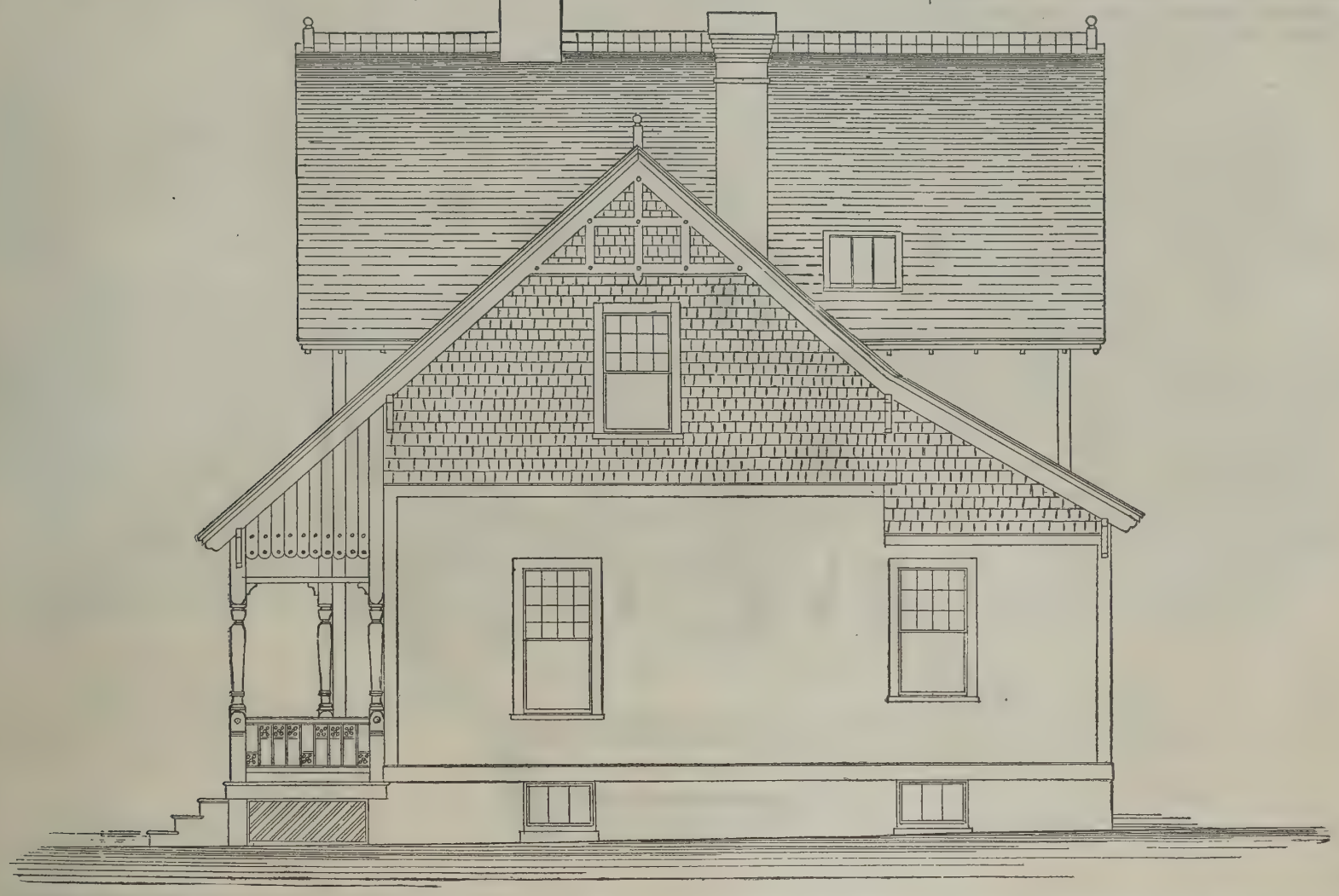
PAINTING.

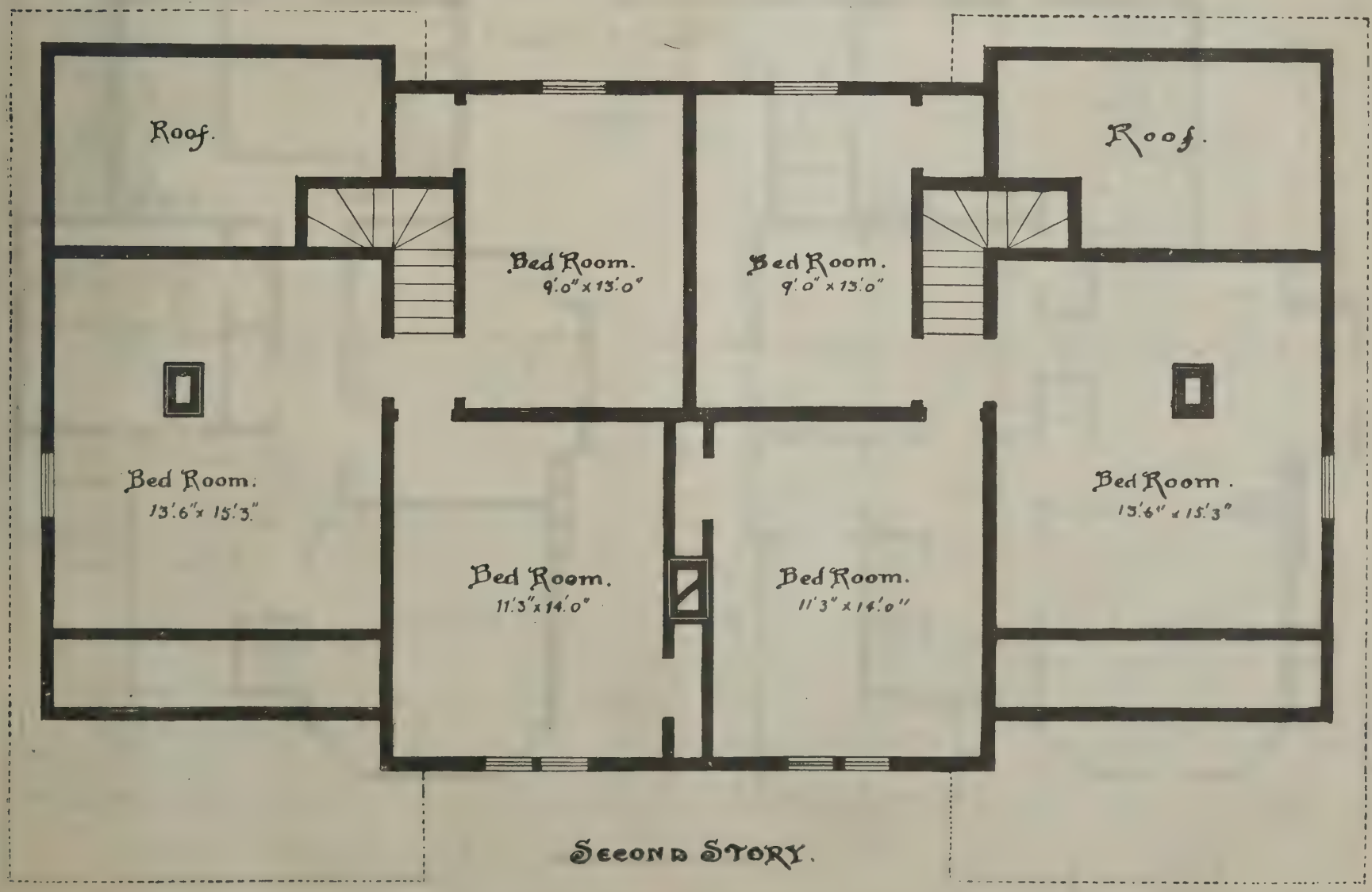
Exterior Work.—All outside work, excepting hard pine floors, which are to be oiled and well rubbed down, to be painted in three good coats, including the shingles. Conductors to have one coat of metallic paint and two coats of lead and oil, and tin roofs and gutters to have three coats of metallic paint.

Inside Work to have two good coats of paint on well prepared ground, knots and defects being shellacked and stopped as required. The whole to be finished in colors as directed. The hard wood is all to be three times shellacked and well rubbed down.

Generally.—Provide all labor and materials of the best and most perfect kinds necessary for the complete finishing of the building in all respects.

GALVANIZED iron for water pipes has been proved in Germany to result in the water invariably taking up zinc, but in no way injurious to health. They have therefore been sanctioned by the authorities.





SECOND STORY.

A DOUBLE HOUSE OF MODERATE COST.

A $3,500 COTTAGE.

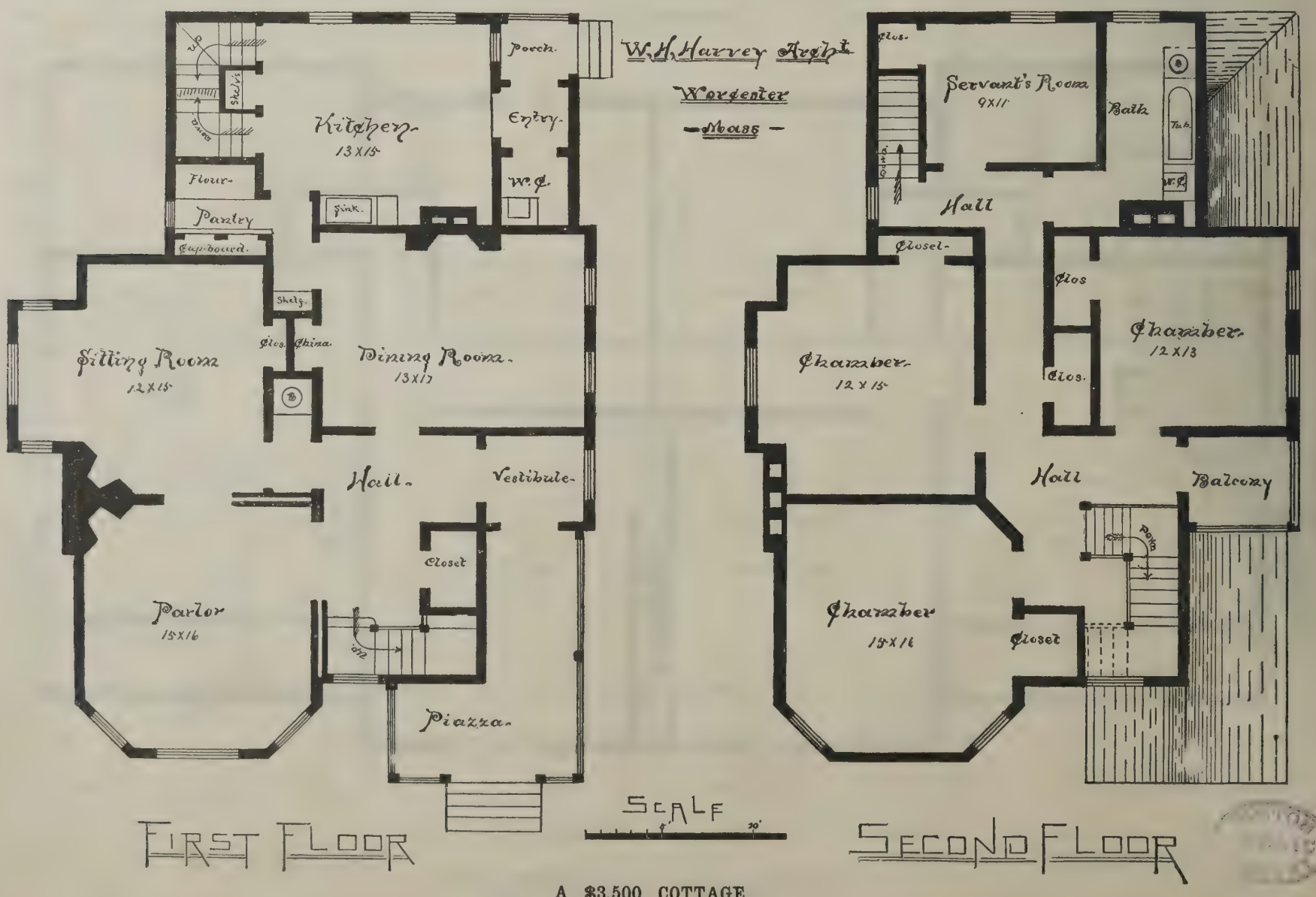
Exterior.—Foundation walls of stone. Under-pinning selected common brick. Cellar under entire house Height of cellar, seven feet six inches. Posts twenty feet long. First story nine feet six inches high. Second story eight feet six inches high. Attic unfinished, but will admit of three good chambers. Exterior frame sheathed and papered with building paper. First story clapboarded; second story and gables shingled. Roof shingled. Principal features, outside chimney, piazza, porch, balcony, gables, etc. *Interior.*—A pleasantly situated interior, containing eight rooms, besides hall, bathroom, and closets. The sitting room, parlor and hall communicate by means of sliding doors. The principal stair-case has landings and cathedral glass windows. The parlor has an art window in bay. The kitchen, back stairs and bath room are wainscoted, and the kitchen has a hardwood floor. The entire interior is finished in whitewood, except the stairway. The parlor sitting room and dining room have fireplaces. All interior woodwork finished on the natural wood. The first story of the exterior is painted three coats, and the second story three coats of creosote stains. Roof painted two coats of mineral paint.

Cement Buildings.

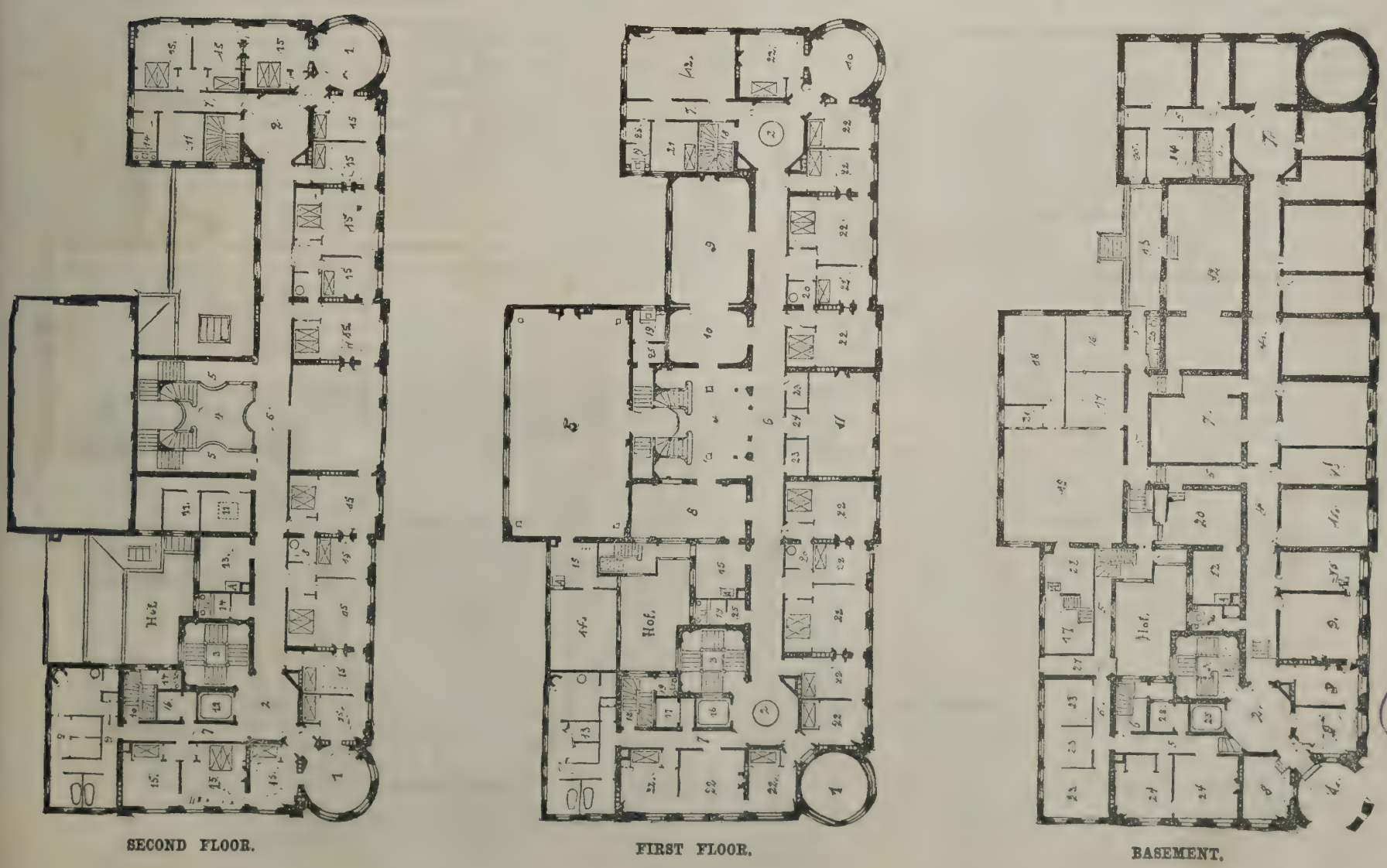
A rapid method of constructing buildings has been introduced by Mr. J. C. Bloomfield, of Blen-na-Lung Leggs, Ireland. He erects uprights, wooden or metallic, either with or without sole plates, and either directly on or sunk under the surface of the ground, or on dwarf walls of concrete or other material, and for roofs he uses wooden, metallic, or other suitable rafters, and on the inside and outside of the uprights or rafters he affixes wire or metallic ribbon strained across, and fills up the space with broken stones, shingle, burned clay, clinkers, cinders, or other suitable materials, and plasters the exterior and interior, or exterior or interior only, of the walls so formed with plaster, preferably with cement plaster, formed of Portland, Castle-Caldwell, Selenitic, or Scott's cement and sand or other suitable materials. Buildings formed in this manner with cement plaster are put up in exceptionally short time, and become quite dry and habitable in a few days, and fitted for immediate occupation, without any risk from damp.

HOTEL AT MENTONE.

We give an engraving of a new and elegant hotel for 150 guests at Mentone, France, on the Mediterranean. This city is one of the favorite places of resort, especially for the winter months. The average temperature is 61° F. It is beautifully situated. The hotels and business part of the town are located near the water. Directly back of them rise the mountains, and here are located many beautiful villas and cottages. Mentone was one of the towns lately affected by the severe earthquake, which produced great consternation among the inhabitants.



A $3,500 COTTAGE.



SECOND FLOOR. FIRST FLOOR. BASEMENT.

HOTEL AT MENTONE.—A. G. RIVES, ARCHITECT, PARIS.

IRON CEILINGS.

During the past few years there has been a very decided advance in the construction of our buildings. The introduction of modern materials and apparatus has provided means of better and often less costly construction, which the public, as a rule, have not been slow to take advantage of. It is, however, a singular fact that we should hold on so tenaciously to the primitive and unscientific method of forming plastered ceilings. As a fact, the material has been in use so long that it is not easy to get the public to abandon it. On a very little consideration, it will be seen how many are the disadvantages of plaster which form serious objections to its use. The principal defect is its weakness. Let there be but a comparatively small vibration or jar in the building—to which, of course, every structure is more or less liable—or let there be a leak of water, and it will crack and fall off in patches, not only necessitating repairs in this respect, but forming a grave danger in the injury liable to be done by the falling material.

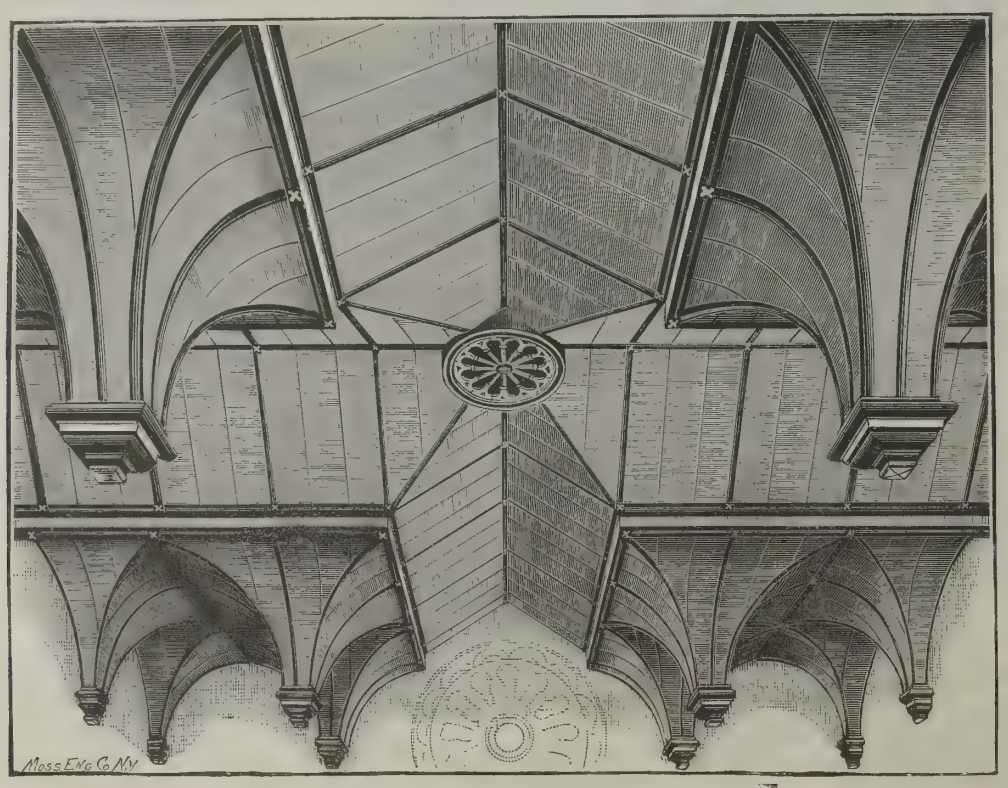


Fig. 1.—A CHURCH CEILING IN IRON.

Unsightly, cracked, broken, and patched plastered ceilings are only too familiar to every owner and occupant of a building, and the result has been the suggestion of innumerable plans by which a strong plastered ceiling might be produced. Among the methods which have been devised to this end is iron or wire netting to be used in place of wooden laths, but this, while improving the matter somewhat, possesses the serious disadvantage of rusting whenever wet comes upon it. It goes without saying that it is impossible to prevent water occasionally coming in contact with a ceiling. A leak in the roof, a broken water pipe, or water upset upon the floor happen now and again in all buildings. The result with iron netting in many cases is that after a few years the rust shows through, looking very unsightly, besides weakening the plaster, so that we return once more to our original position, with broken and cracked ceilings. But, even where the lathing is good and secure, there is another decided objection to plaster which is often overlooked. To incorporate it, a considerable quantity of water is necessary, and this water, during the process of evaporation, will fill the building with moisture. Now, all woodwork shrinks to some extent, be it ever so well seasoned, when fixed, and a skillful and judicious carpenter, who understands the effect of the shrinkage, will make due allowance for it in forming his joints, cutting them tight on one side and slack on the other, with the view of adjustment by the shrinkage. If, from the plaster or any other cause, the building should be filled with moisture, it will penetrate the timber, cause it to swell, and do considerable damage in splitting and cracking the woodwork. Without doubt, plaster is very unsatisfactory. What is required is not a change of *method* of construction, but an entire change of *material*, and in this will be found the only satisfactory solution to the problem.

The question of the decoration of ceilings is scarcely a less important one than that of the material used in their construction. Although there has of late been a successful attempt to treat the surface of ceilings in the more important buildings, still little has been done beyond either papering on the plaster or constructing paneled woodwork at great expense. Often a blank white expanse, they are not only conspicuously beautiless, but detract considerably from the decoration of the remainder of the room.

The material of the future for universal use for ceilings must be one which will be adaptable to the purposes of decoration and ornament, and which will substantially remove objections attendant upon the use of plaster. Such a material is iron, provided that it be properly treated. In many minds it is probable that the word iron in connection with the proposed use for ceilings suggests the idea of coarse corrugated sheets, nailed up roughly on the joists, with the nail heads appearing conspicuously, and with the laps and joints all showing. Used in such a manner iron would not be a success, but properly treated there is no reason in the world why it should not prove not only as substantial and lasting a material as could easily be had, but, from the illimited variety of the forms into which it may be contrived, at the same time one of the most artistic.

Considering its merits first from the point of view of construction, iron would appear to be eminently well calculated for the purpose of ceilings. When formed into sheets with small corrugations, and properly fixed in such a manner as to permit of the escape of any water falling upon it, it will prove to be really a permanent ceiling, which will be essentially indestructible, which will not crack and fall off by jarring or vibration of the building and that will neither stain nor soak off whenever there is a leak of water. Then it will prove of great assistance in preventing the spread of fire, and, if used with a lining of asbestos felt, will be practically fireproof. In recent reports of the New York Fire Department it was pointed out how great the danger is, on a fire occurring in buildings having plastered ceilings, by the manner in which the plaster falls off and allows of a draught through the floor between the joists. It was strongly recommended that all such ceilings should be rendered somewhat fireproof by the insertion of sheet iron between the floor and ceiling. If iron were used as a ceiling, of course the inside sheet could be dispensed with, and hence a saving be effected.

But perhaps the chief advantage of the material lies in its lightness, for it is in this fact that there is a very considerable benefit. An iron ceiling is approximately eight to ten times lighter than plaster, so that the supporting timbers may be a good deal lighter. Take the case of a church or other building having a roof area of, say for example, one hundred squares. An iron ceiling for such a building would weigh about 5 tons, while a plastered ceiling would weigh from 40 to 50 tons! It is not difficult to see how much safer the lighter ceiling would be.

As to the artistic value of iron as a material for use in the construction of ceilings, much might be said. In this city one firm have given some considerable study to the subject, and have manufactured it with a good deal of success. This is A. Northrup & Co., of 54 East 23d St., New York, and 23d and Mary Streets, Pittsburg, Pa., by whose courtesy we are enabled to present our readers with two engravings showing two separate descriptions of the treatment of the material. Fig. 1 represents a view of the iron ceiling in the Methodist church at Warren, Pa., and has quite a unique and certainly a very handsome appearance. The iron itself is crimped or rolled into very small corrugations and is then arranged in panels, the joints being covered with raised mouldings. At the corners of each panel are ornamental rosettes, covering the joints of mouldings. The large ornamental drops are blocked out from the ceiling, and form a special feature.

In Fig. 2 is represented the ceiling in the parlor of T. D. Miller, Esq., at East End, Pittsburg, Pa. This is arranged, as is usual, on a flat surface, by being skillfully and prettily divided up into panels, with the raised mouldings and rosettes as before. On some of the panels floral and other designs are painted, which, with the bold cornice of iron, produces a strikingly pretty effect. The crimp or corrugations are so small that when the iron is fixed in position they cannot be discerned. The only effect is to soften down the colors and to render the design much more artistic and pleasing.

Some sheets are corrugated right across, in various descriptions of crimp, while others are crimped differently on the corners to the remainder of the sheet. One of the most beautiful examples is a raised floral pattern thrown into relief by gilding, which, with the tinted and textured background alternated with plain tinted panels, looks very handsome.

One of the most attractive qualities of this material is its immense variety. The desire for novelty, perfectly proper as it is as a principle, is often carried to extremes in house building, and odd and often useless features are frequently added to the elevation, in the desire to make the house novel in appearance. Probably there is no better opportunity for variety than in decoration with iron ceilings. No two rooms are alike in their treatment, and further, and indeed limitless, variety may be brought about by using as many colors as may be desired in painting them.

In view of what has been said, it will be clear that the use of the material is not limited to any particular description of building. For ordinary dwelling houses, for stores, warehouses, factories, churches, halls, concert rooms, etc., it is equally suitable. It is manufactured from a plain crimp or corrugation to the highest stage of elaborateness and beauty. The small flutings serve with much benefit for acoustic purposes, which is an advantage of great value in schools, theaters, halls, and other buildings for public gatherings. On existing plastered or other ceilings it may be applied without difficulty, and a special construction enables it to be applied to T iron and all other descriptions of ceilings.

Of course the question of cost has an important bearing upon the merits of a material of this kind. Certainly it is somewhat higher than plaster, although not greatly so; but having in mind all its advantages, taking into account the saving of material in roof and floor timbers by the lightened weight, the time it will last, the little attention it requires, the assistance it lends in preventing the spread of fire, and last, but not least, the beautiful appearance it presents, there can be but little doubt that while it costs a little more at first, it is really far cheaper in the end.

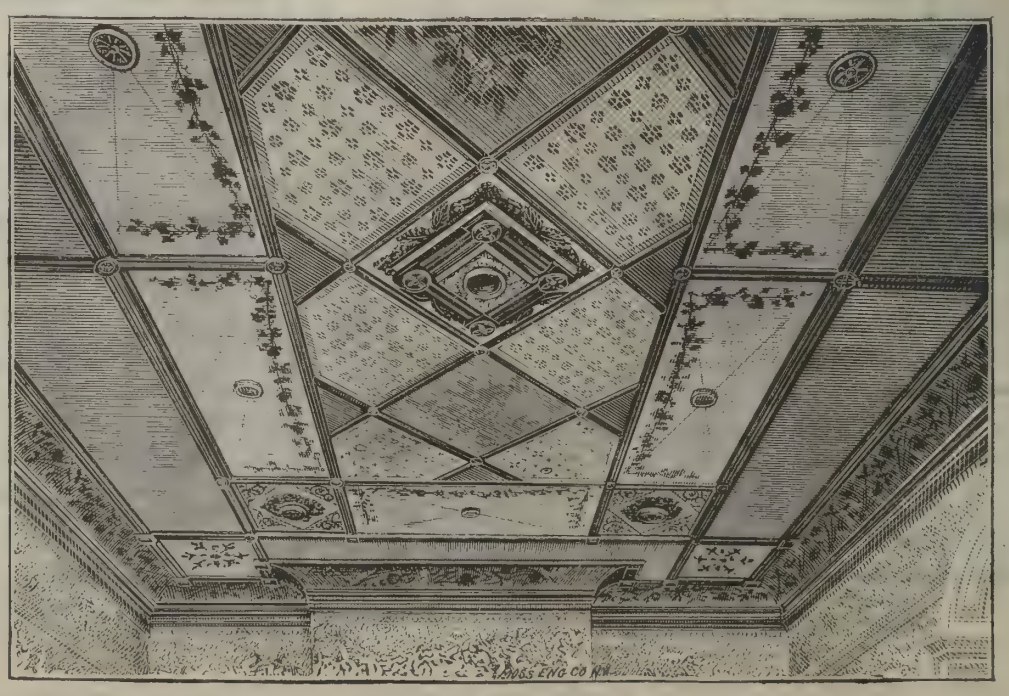


Fig. 2.—A PARLOR CEILING IN IRON.

The Acropolis of Athens.

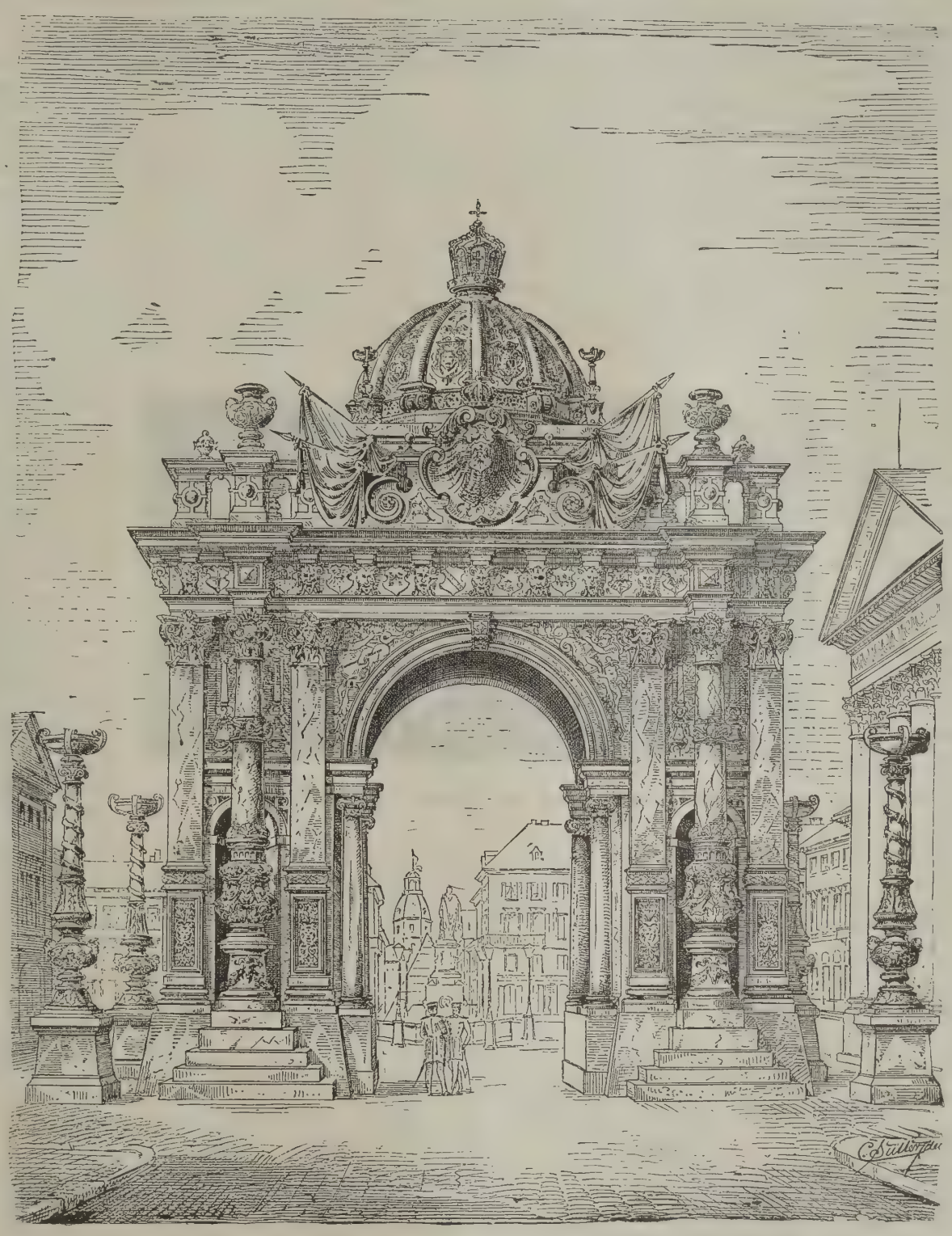
Before the close of the fourteenth century the first Duke of Athens, Neri dei Acciajuoli, transformed the Propylæa into a palace, which he surrounded with fortifications, and of which he destroyed in all probability a considerable part, so as to change it into a princely habitation according to the ideas of the age. Up to this period the exterior of the edifice was in a good state of preservation, but the taking of Athens by Mahomet II., about 1456, and the effect of artillery already in use at this time, resulted in an almost complete destruction of the monuments of the Acropolis. Although the lords of Athens had previously erected numerous fortifications, it was necessary to strengthen them still further, in order to make the Propylæa, now the habitation of the Aga, and the only accessible point, secure from artillery which might be brought to bear against that structure. An immense bastion was therefore constructed in front, the approaches to the citadel were shut by a line of walls and gates, and the ancient towers and walls were buried 40 feet underground. The Parthenon became a mosque, the Erechtheion a harem, and, in their aversion to images, the Turks mutilated every piece of sculpture that came within their reach. In 1656, on the eve of a great festival the Turks wished to celebrate, the Aga Joussouf took it into his head to destroy the church of St. Dimitri, which is built in the plain at the foot of the Museion. With this object in view, he had three pieces of cannon planted, and ordered his soldiers to be ready on the following morning at break of day. This Joussouf lived in a great dome, constructed under the principal vestibule of the Propylæa, which was used at the time as a depot of arms and powder magazine. During the night a thunderbolt fell on this little arsenal, which exploded, and blew up the Aga and his whole family. The invention of gunpowder has been fatal to the monuments of the Acropolis. Thirty-one years after the above event the Venetians, who had just taken possession of the Morea, menaced Athens. The Turks, determined to make a vigorous defense, immediately set to work with the intention of fortifying still further the Acropolis and constructing batteries, one of which has been elevated on the ruins of the Temple of Victory, which indeed they ruined for the purpose. The Venetians, however, landed at the Piré and the Count of Konigsmark, lieutenant of Morosini, planted his mortars on the hills which surround the western side of the Acropolis. The bombarding commenced on September 26, 1687. The Parthenon, which commanded the platform on this side, and in which the Turks had shut up their families, was more particularly aimed at. The Turks had also placed in it all their most valuable effects and a large quantity of gunpowder. The bombs themselves would not have penetrated the solid roofing of the Parthenon, but sparks having got into the structure, the powder took fire, and the Parthenon blew up on the evening of September 28. Almost all the cella and its frieze, eight columns of the northern portico and six of the southern portico, with their entablatures, were overthrown—the vast temple was cut, as it were, into two masses of ruins. The Turks, terror stricken, surrendered the following day, and Morosini entered in triumph the Acropolis. By his orders the horses and car of Minerva, in such admirable preservation that the most indifferent traveler spoke of them with enthusiasm, were carried away; but the work was so badly conducted that the whole group fell, and was shattered on the rock. The captains of Morosini followed the example of their chief, and fragments of the Parthenon, according to the testimony of Bronstedt, were carried even to Copenhagen.—*M. Delecluze.*

Architectural Excellence.

Architectural excellence consists in the judicious and skillful adaptation of an edifice to its specific destination and in the appropriate and tasteful display of its interior and exterior ornaments.

Every building of magnitude should be distinguished by decisive and positive marks of its purport. The church, the castle, the mansion, the jail, the temple, and town hall should each have its apposite characteristic form and features.

The Greeks and Romans were attentive to this principle; and the "architects" of the middle ages, though unrestrained by the rules and orders of their classical predecessors, very generally made a specific distinction between the edifice intended for religious worship and ceremonies and that appropriated for habitation.



ARCH OF TRIUMPH, KARLSRUHE.—DESIGNED BY PROF. HERMANN GOTZ.—*From Architektonische Rundschau.*

A critical examination of the buildings of any country or community displays with a significant truth the character of the people who inhabit them, and is a sure indication of their manners and customs. This inquiry must be replete with amusement and instruction, if pursued with a single and unerring determination to ascertain the truth; but when employed in the course of theory, superstition, or any sectarian dogma, it is repugnant to reason and hostile to good sense.

The stately colonnade and decorated frieze of a Grecian temple or the rude and ponderous circles of Druidical customs can only be properly appreciated and understood by those who have diligently and scrupulously analyzed the history of the refined people who elevated the former to excite our admiration, or the mysterious beings who reared the enormous masses of the latter to awaken our astonishment. In the one instance we have detail combined with its proper assimilation to mass; in the other, we find mass without detail. Each is distinctive and has its own characteristics, and tells, without words, the character and habits of the people who designed them, and have left these monuments to tell their story to other ages.

Every object of nature and art that is inherently grand or beautiful is calculated to afford pleasure to the human mind. The sublime and towering mountain, the romantic cascade, the interminable and restless ocean, the broad and translucent lake, are all highly interesting and impressive; but these are the inimitable works of an omniscient Architect. Man vainly endeavors to mimic them, and advance the productions of art to vie with those of nature. Though, however, his works be comparatively small and insignificant, they often excite the amazement and admiration of his fellow creatures.

Genius aided by science can produce surprising effects—can furnish to the curious and inquisitive mind ample sources of study and delight. This is fully verified in the ancient architecture of Great Britain, as well as in the splendid and much prized edifices of Greece and Italy. It has long been the fashion, founded on prejudice, to praise the latter at the expense of the former; but the impartial historian and critic will award to each its proper and just share of excellence. Each style of architecture has its peculiar beauties, merits, and defects, and each will afford important lessons to the judicious architect; but the man who tamely and frigidly copies either will impeach both his taste and his judgment, and add but little to an "American style of architecture." We have many buildings where the architect has manifested both "genius" and "science" in their design and execution; where there is a happy blending of detail and mass. We find such in almost every city in our country—buildings that show the marks of careful study and a proper distribution of mass and detail. They stand out bold, plain and impressive, like a graceful and elegant female, dressed in a light and flowing drapery, as the latter adorns the former. We find such on our crowded thoroughfares, often surrounded with shady neighbors; but they resemble a dignified beauty accidentally surrounded and incommoded by a motley group of the rabble.

Finally: All buildings should, so far as it is possible for the architect to meet the requirements, tell their own story, whether they are intended for church or state, mercantile or other purposes; and in their uses much depends on the space that can or should be used to make them massive, or how much can be given up to light and airy detail. All structures must be massive enough to show that they are substantial, and the detail should, too, be in keeping, being bold, clean, and impressive, and all having a meaning.

If the designer's pencil did not run so easily into graceful curves and lovely flowers, that look so beautiful in the picture; if its point would get directed to bolder, but subservient, detail to the mass, those structures would have a lasting appearance and enduring character, that would speak for a nation's grandeur, and perhaps in the future it would lead to an American style of architecture.—*L. D. Cleveland.*

Artificial Rubies.

At the Academy of Science's meeting held on March 14, M. Fremy read a memoir on the researches which he has made with M. Verneuil to artificially produce ruby. An alumina crucible was used, so as to avoid the presence of silica, which has the effect of imparting a lamellar structure to the product. Under such conditions, with alumina separated from calcium fluoride by a perforated platinum septum, they have obtained perfect crystals of alumina, which, being colored with traces of chromic acid, were an exact counterpart of the natural stone.

ROSE COVERED PORCHES.

T. W. GIRDLESTONE.

How is it that plants are often seen flourishing in cottage gardens with a luxuriance which seems unattainable in gardens where all conditions appear to be so much more favorable? The great masses of hepaticas, for instance, in the cottagers' gardens in some of the western shires are unsurpassed, while the clumps (sometimes almost forests) of madonna lilies are the envy of passers-by, and the climbers by which the cottage is often half hidden seem to grow with more enjoyment than anywhere else. Perhaps the reason may not be further to seek than in the employment of materials well suited to the climate and conditions, for there is no doubt that common plants well grown are more decorative than half starved specimens of more brilliant things, for whose proper cultivation the requisite means are not attainable; and a cottage porch smothered with honeysuckles and some old fashioned rose is about as pleasant a sight as can be seen, in spite of the climbers being neither rare nor costly. But the supposition that the denizens of cottage gardens are so fine because they are indigenous or exceptionally hardy plants is not sufficient to account for the handsome subjects there so often met with. The finest Catherine Mermet I ever saw was climbing on the chimney of a cottage by the roadside in Surrey, and in a similar position in another part of the same county I have seen blooms of Gloire de Dijon such as I have never seen elsewhere, even in celebrated rose gardens. Every one will doubtless recall Canon Reynolds Hole's description of the noble specimens upon the walls of a cottage of the glorious but hardly-to-be-flowered Noisette, Cloth of Gold, which so rarely gets sun enough to ripen its shoots in this climate, and even more rarely succeeds in preserving them uninjured until the flowering time. I myself have experienced the pangs of jealousy when passing a house masked with a climbing devoniensis in full bloom, the cultural attention to which consisted in its being occasionally gone over with a long handled bill hook, such as is used in trimming hedges, "just to keep the shoots from rattlin' on the windows."

In spite of these seemingly anomalous instances, however, the real reason of the presence of striking specimens in cottage gardens will probably be found in the fact that, not being too numerous, each plant is tended and looked after with the greatest care. The precious and carefully collected road scrapings, not having to be spread over too wide an area, are heaped round special favorites to provide at once food and protection, and thus is encouraged that luxuriance of growth which renders possible the rose covered porches of our Surrey cottages, whereby a pleasant feast of brightness is afforded to weary travelers passing by.

CLIMBING ROSE ON PORCH OF COTTAGE.

It is remarkable how seldom the white rose (double or garden variety of Rosa alba) is to be seen in any but cottage gardens, and the same may be said of its near relation, the maiden's blush. Such good roses, capable as they are of highly ornamental treatment and so individually charming, certainly deserve more general culture than they receive. The white rose does equally well as a bush five feet to six feet high, or as a low climber. The cottage porch we engrave shows it in the latter form, trained to meet a honeysuckle in the front, the training not overdone, but with that happy knack of supporting and guiding without apparently constraining, that best shows the beauty and natural growth of rambling plants.

ROSE ARCHES.

The mode of decorating our gardens with arches of roses carried over paths seems of late years to have gone very much out of fashion, although roses so grown may be made to constitute a very attractive feature, a fact to which an engraving in a recent *Garden* abundantly testifies. It has been urged that rose arches are always ineffective or inconvenient, and generally both; but if so, the reason is probably to be found in a want of skill in the cultivator or constructor, or both. For there is no design that is safe from being made to appear ridiculous through its attempted execution in ill chosen materials. A house built of bricks and stucco from designs intended to be carried out in stone would not be more grotesque than the gaunt iron arch one sometimes sees with a stunted rose bush growing half way up each of its pillars. Such an arrangement certainly is ineffective, but then it is not a rose arch. Where there has been a want of success in making rose arches decorative, the failure may usually be attributed to one of two causes—either an attempt to furnish them with roses entirely unfitted for the purpose, or the employment of too many varieties. The number of available sorts is not large, and perhaps a dozen names would exhaust the list of first rate kinds, but the employment of these or any twelve different roses upon some half a dozen arches would effectually preclude the possibility of anything like a fine display. On the other hand, what could be more striking than such a series of arches, each arch densely wreathed with the evergreen Felicite perpetuelle, probably the best of all varieties for the purpose, with its rampant growth, its dark green persistent foliage, and its myriad pure white flowers, each one a perfect rosette? If numerous varieties are employed, the result is seldom satisfactory from a decorative point of view, because the different sorts will not flower at the same time; but this difficulty is obviated by using only one variety at a time, whereby the striking effect obtainable by having a number of arches of roses simultaneously sheeted with bloom is insured.

In case of the employment of several varieties on a series of arches, each arch, at any rate, should be covered with one rose, and not have two different kinds planted beside its two pillars, so that at the flowering time each arch, at least, may be complete, rather than have one half blossoming while the other half is green or bare. Even if they can be induced to bloom at the same time, unless they are of the same class and habit, the effect of two different roses mixed up together is generally somewhat incongruous and unpleasing.

In the selection of varieties, the qualities to look for, in addition to the obvious essentials of rampant growth and profusion of bloom, are hardiness, pliability, persistence of foliage—which foliage should be handsome, but only of moderate size, as the very large leaved roses, when grown on arches, get their leaves so lacerated by the wind and soon look untidy—and comparative freedom from the more disfiguring of rose pests, such as mildew, etc. In addition to Felicite perpetuelle, which is unsurpassed as an arch rose, there may also be mentioned as fulfilling the above conditions the Ayrshire splendens, whose white flowers, less regular in outline than those of the last-named, are relieved by a slight pink edge. These two varieties are the pick of their respective classes, but if a pink variety in the same section be desired, there is no fault to be found with the hybrid Laure Davoust, whose charming pink flowers are produced in immense clusters, except that in the north it is not quite hardy enough to avoid some disfigurement in a severe winter, unless it be somewhat protected with bracken, or such covering. In the southern counties, however, both this and the climbing Aimee Vibert, or Aimee Vibert scandens, as it is sometimes pedantically called, make good arch roses, and the two are sufficiently near in character to make a good pair, the one pink and the other white, where several sorts are desired. But when it comes to the noisettes, there are two varieties of which use should be made whenever possible; for if not perfectly hardy they are well worth the slight protection of fern, which renders them so. The first of these is Reve d'Or, an exceedingly vigorous rose and the hardiest of its class—a rose which could not be considered otherwise than a highly ornamental plant, even if it never flowered, for its young shoots are brilliant red, and the handsome foliage is rarely without some bright tint; but its character does not belie its name, and the wealth of golden and tawny blossoms displayed constitutes truly enough a vision of gold, and not a fleeting vision like an every-day dream either, for the flowering only ends when the frosts begin.

The second variety is the now well known and deservedly popular William Allen Richardson, not so rampant as Reve d'Or, but quite sturdily vigorous enough for all practical purposes, and very nearly, if not quite, as hardy as the latter. At any rate numerous plants of William Allen Richardson of various forms passed uninjured through the trying winter of 1885-86 with only the slight protection of a few fronds of bracken twisted among them, which all teas and noisettes deserve, and are the better for in hard weather; and, as far as can be seen at present, the long spell of cold now coming (it is to be hoped) to an end, although the thermometer twice registered upward of 25° of frost, has not inflicted appreciable injury on plants of this delightful noisette, whose decorative value is enhanced by the fact that the bright orange color of its flowers is unique among roses, while the plant is almost evergreen and thoroughly autumnal.

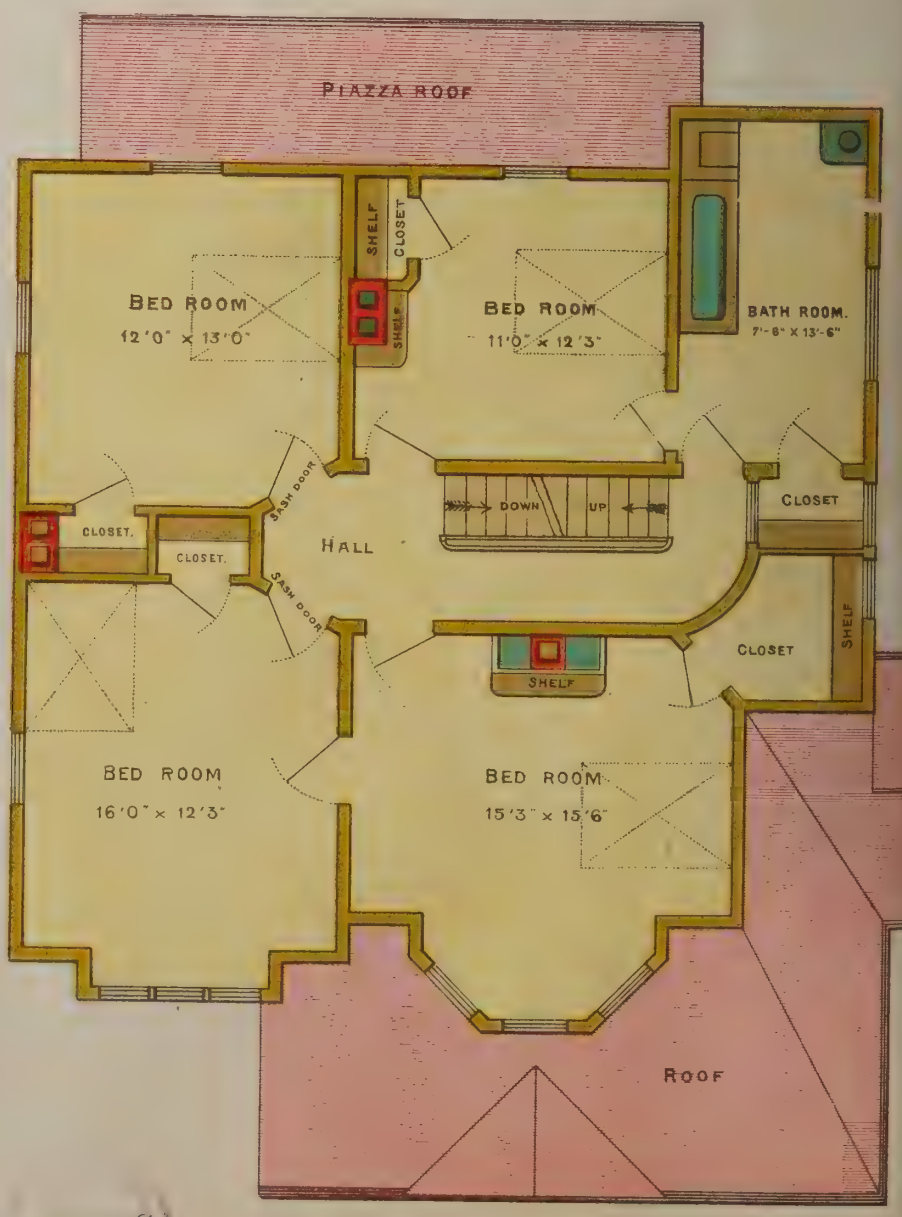
Red roses that are available for training over arches are few and far between, but the hybrid tea Reine Marie Henriette is a first rate variety for the purpose, and, growing with immense vigor, produces its bright, clear red flowers in abundance throughout the season. The attractive semi-double red hybrid tea or hybrid noisette Reine Olga de Wurtemburg, which was figured in the *Garden* early last year, would make an admirable arch rose, but for the solitary objection that its magnificent foliage is liable soon to become "tattered and torn" by the action of the wind when this rose giant is grown anywhere away from a wall. But a lack of good hardy red climbing roses is no reason for ignoring good hardy climbers that are ready to hand, even though they be not bright colored; and there are two single roses which are both better worth growing to cover arches than all the hybrid perpetuals so often recommended put together. One is Rosa brunonis, often called the Himalayan brier, which makes incredibly long shoots, enough to furnish an arch in a single season, and of which the pretty bluish green foliage is almost hidden at the flowering time by the mass of snowy single blossoms. The other, last, but not least in value at any rate, is Rosa polyantha, a Japanese sub species of R. multiflora, and one of the most attractive roses in cultivation. It has all the recommendations enumerated above. It grows with the utmost luxuriance, and regularly becomes smothered with blossom. M. Jean Sisley, of Lyons, declares his belief that it is the hardiest rose in existence. It may be easily trained in any direction. The foliage hangs on late, and though composed of many leaflets, the leaflet is not large, and the plant appears almost exempt from mildew. Moreover, it will grow in any soil or situation, it roots as a cutting with the greatest readiness, and its white flowers, though individually small, are produced in such immense trusses as to be highly decorative, while their delicious fragrance scents the air for yards round a large plant in blossom. Under these circumstances, the only wonder is that this plant is not abundant in all gardens where roses are appreciated; but the fact probably is, that too many gardeners still consider single flowers a reproach to a rose, which no other merits can compensate.

There are many other roses which are often included in lists of kinds said to be desirable as arch roses, such as the Boursaults, which, however, cannot conscientiously be recommended on account of their dreary coloring. Again, the charming rose which goes under the name of Fortune's yellow is too tender to be grown in this country anywhere but against a wall—a position which it thoroughly deserves; and the same may be said of the banksias. None of the mosses are of real value for the purpose. Lanei is the only one of sufficient vigor, and that is too stiff and rigid to be ornamental. One or two hybrid chinas, such as Blairi No. 2, may be employed, but all the hybrid perpetuals practically involve an outlay of time and trouble by no means repaid by the effect produced; while the few gallicas, etc., that might possibly be available are such victims to mildew as to be hardly ever otherwise than an eyesore.

In arranging rose arches it must, of course, be borne in mind that it is essential that things intended for use be eminently usable; and if arches are made across a path, care must be taken that they do not make such path inconvenient for traffic. Thus, the pillars of an arch should be at least three feet from each margin of the walk spanned, in order that the dresses of passers-by may be safe from the thorny shoots; and if the walk be six feet wide, this will give a base of twelve feet wide, for which a central height of ten feet will be found to give an effective and practical arch. Where there is to be a series of arches, they should be at least three yards or four yards apart, and each arch should be composed entirely of iron, for if the uprights be made of wood they soon give way at the ground line, especially when the plants trained upon them become vigorous and offer considerable resistance to the wind. The only objection to iron uprights is that from their smaller diameter they are less convenient to train plants to than wooden posts; but any difficulty arising from this may be obviated by fixing a few horizontal cross bars on to the iron uprights, and to these the rose shoots can be tied so as to avoid undue crowding in the earlier stages of growth. The best way of planting is to put in two trees of the same kind, one at the foot of each upright, and then by liberal culture to encourage the most vigorous growth possible; but if a variety is used which does not furnish well, there is no reason why two or three plants of it should not be planted at either pillar in order to get the arch more completely wreathed. Then, if varieties well adapted to the purpose be employed, the shoots from the two sides will soon meet across the center, and, interlacing, form a triumphal arch or series of arches.—*The Garden*

THE COTTAGE (SHOWN IN APRIL NUMBER) AS ENLARGED.

Plan of First Floor.

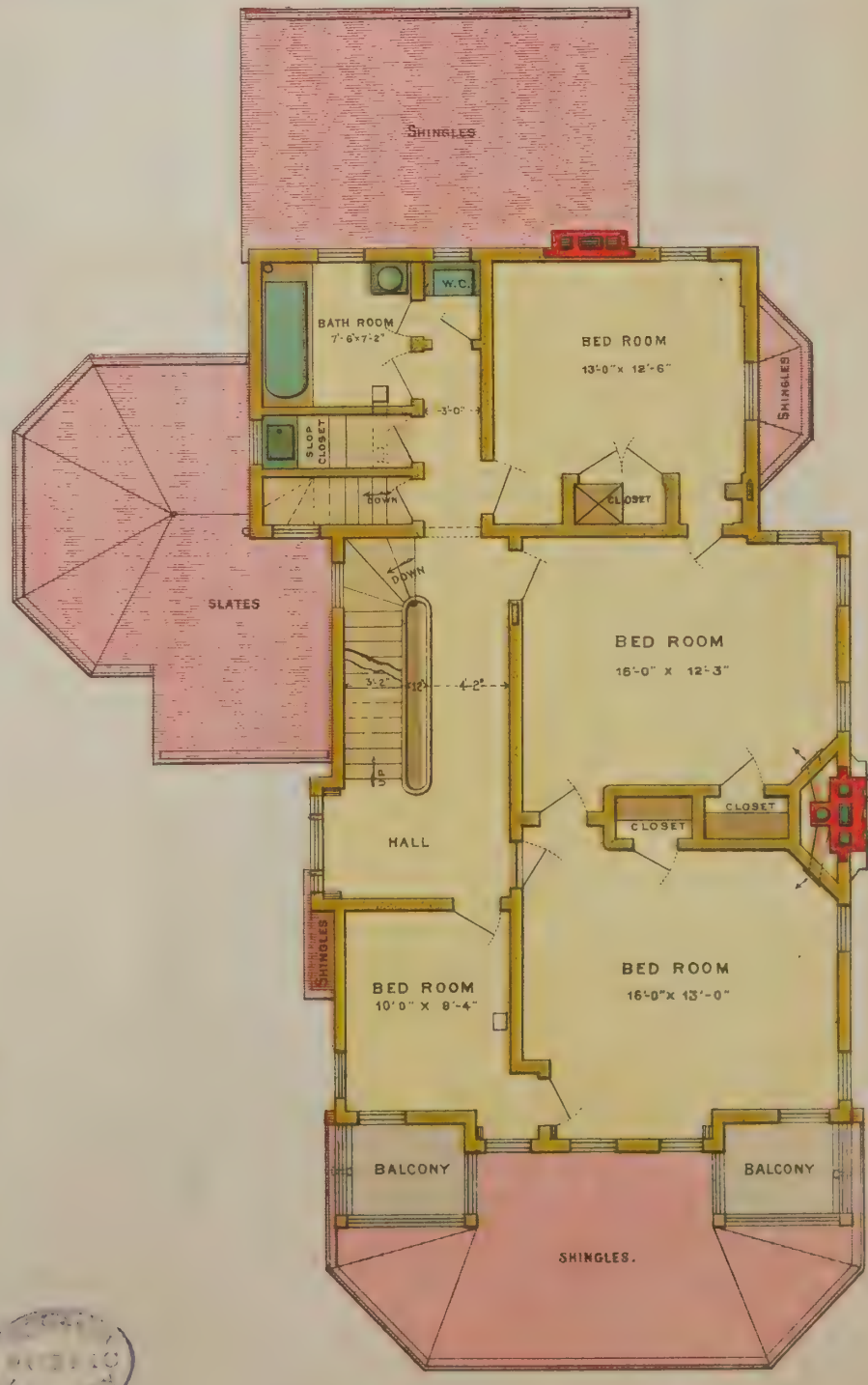


Plan of Second Floor.

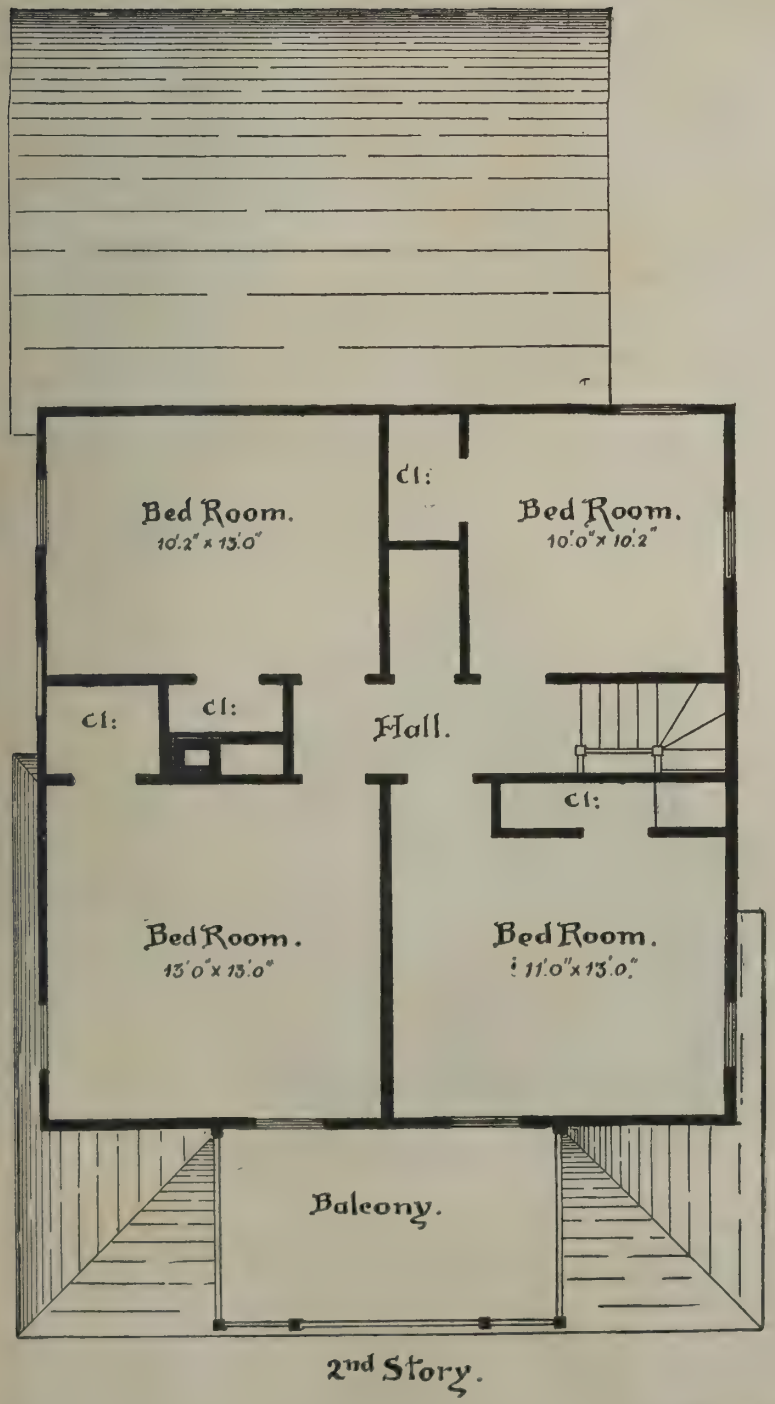
SCHUMACHER & ETTLINGER, NEW YORK.

A DWELLING AT ORANGE, N.J.

Plan of First Floor.



Plan of Second Floor.



A DWELLING OF MODERATE COST.

[For description see page 118]

RAISING THE OLD UNITED STATES COURT HOUSE IN BOSTON.

This building was originally the old Masonic Temple, built in 1832, in rather heavy Gothic style, a view of it in outline being given. It was was 60×80 feet in plan, with a heavy tower 16 feet square and 95 feet high at each angle of the Tremont Street front; was five stories, and was lighted by long arched windows on the sides. The walls were of granite, 22 inches thick on the average, and the weight to be raised, as hereinafter described, was estimated at nearly 1,500 tons.

After serving as a court house until the court was removed to the post office block, the building was sold, and the new owners desired to fit it up for business purposes. The 80 foot front was on Temple Place, which had been widened several years before, so that the building projected three feet over the new street line. At that time the owners charged so high a price for damages that the city declined to pay the sum. The present owners, therefore, feared that should they demolish the building they would be obliged by the city to adopt the new line; and, in order to save the 240 feet of ground space, they adopted the expedient of raising the old building and inserting girders underneath and iron columns for the store fronts. The line separating the part raised from that removed is indicated in the perspective diagram, the raised portion being about 36 feet high.

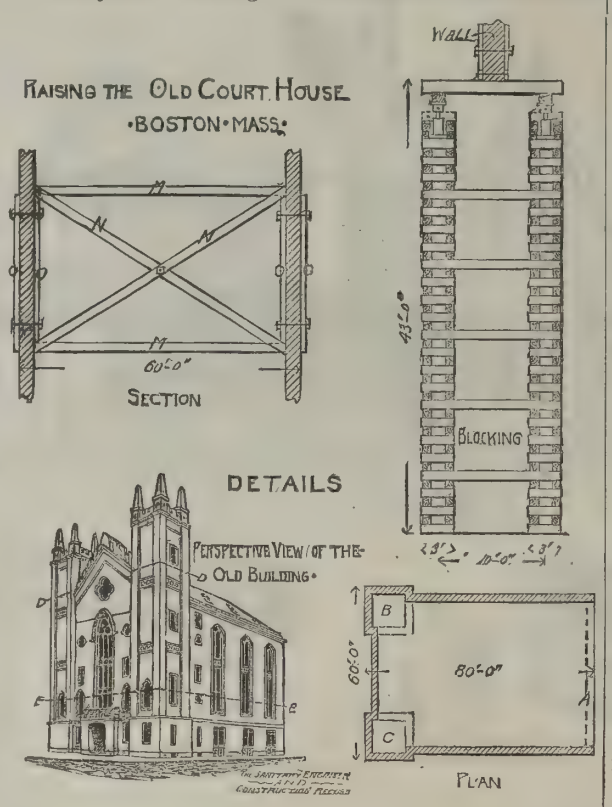
The contractor for the work was Mr. Issac Blair. The original design was to cut down the towers to the level of the roof, remove the interior work, and raise the exterior walls and towers intact.

After beginning the work, however, the contractor decided that as the rear wall (A, see small plan) had to be removed to take in an alleyway at the rear, and as the interior portion, B C, of the towers had a comparatively slight bond with the exterior, these might better be removed.

This resulted in dividing the building virtually into two halves, since the window at the front ran nearly to the peak; and it was noticed as the work progressed that any inequalities in raising of the two sides was indicated by opening and closing of the joint at the key of the arch above this window. It will be noted, also, that the side walls were divided into nearly separate portions by the long windows in them. To insure the stability of the whole, long timbers (M, see sketch) were braced from wall to wall with diagonals (N) in a vertical plane between them. The diagonals were bolted at their intersection. Timbers were placed across each opening at top and bottom, both inside and outside, and strongly bolted together. These serve also to support the ends of the diagonals and interior braces. Binding timbers were also placed each side of the openings, both inside and outside. Heavy tie rods in pairs at top and bottom of the openings served to tie the walls lengthwise, and similar rods were also run across the building. The general arrangement is shown in Fig. 1.

When this was all ready, the walls were pierced for "needles" at *about* 3 foot centers, according to the load to be borne. These were 14×14 inch hard pine, and were supported on two ranges of blocking, which were spaced at about 10 feet on centers. To prepare for this, excavations were made on each side of the foundation, so that at the start the cribs were 28 feet high, and at the close they were 43 feet high.

The cribs were built up of 6×8 inch timbers, and were each about 3 feet thick. At intervals of about 5 feet vertically, lines of timbers were carried across the space between to stiffen and bind the whole (see sketch). Several timbers were also carried through the blocking, across the building, and butted against the side walls of the adjacent building. There were also exterior shores



as seen in Fig. 1. An opening for the passage of carts was left through the cribbing at the front, and others at the side for carrying in material of various kinds. The "needles" rested directly upon longitudinals 14×14 inches, in lengths of 40 to 60 feet, against which the upper ends of the lifting screws took their bearing. The screws were 18 inches long and had a lift of 14 inches each; and as there were 300 in use, they were estimated to have a load of four to five tons each. Under the towers they were but 12 inches apart. They rested on 3 inch plank crossing the cribs, and were worked by six men, one on each side of each of the three walls turning each screw consecutively a definite amount. These were followed by a gang of men, who, as soon as the screws were out their full length, inserted new blocking. The job was eminently successful, and not the slightest accident occurred throughout. The cost also was very low, being about $3,500. The work of refitting was, of course, in addition to this.—*Sanitary Engineer.*

Gelatine Moulds for Reproductions of Carving.

Piece moulding, whether in clay, plaster or any other material, involves considerable skill and time; hence its unsuitability in reproducing large objects; and this renders it necessary to have recourse to a process not only more easy and quick, but to a great extent obviating the necessity of manipulating the casts when they issue from the mould. A process of moulding with gelatine was evolved, and it is applicable in the reproduction of big objects, by reason of the large area which a single mould can cover. As the gelatine is elastic, a great extent of what is technically called "undercut" in the carving may be embraced in one mould, thus rendering unnecessary the making of a number of joints.

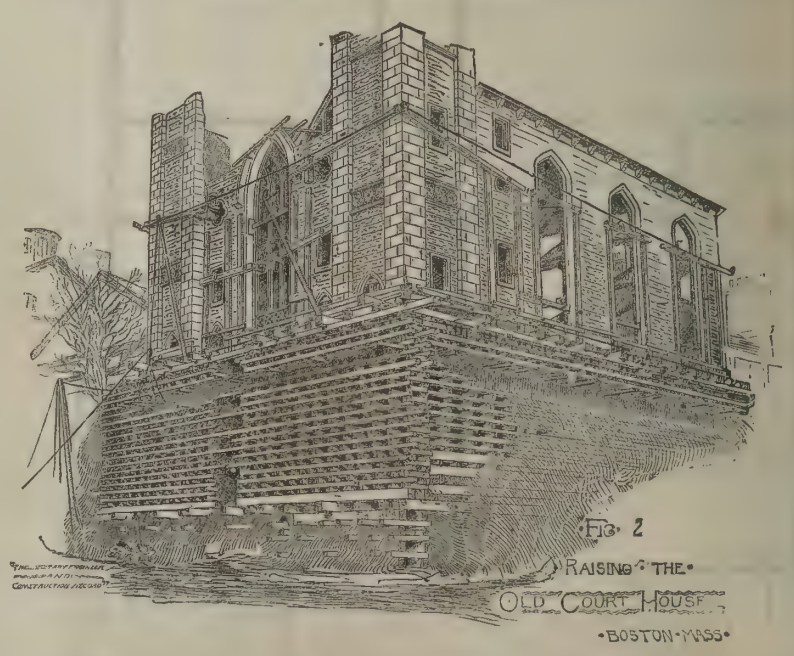
In withdrawing the elastic mould from the object under treatment, the gelatine stretches itself in order to become released from the undercut, but it regains its shape almost immediately, without destroying any of the extreme accuracy with which the gelatine is able to repeat every mark and grain on the surface produced. In every class of piece moulding, the method of covering the carved surface with a number of inelastic moulds, capable of being individually removed with ease, is theoretically the same; but the perfection of the plaster piece moulding depends on the skill of the moulder in so disposing the moulds as to have the fewest possible joints when the piece moulds have been made to completely cover the carving. These piece moulds are, in turn, covered, or rather backed, with larger moulds, which serve to hold them in position when the cast is being made. In the gelatine process the backing or wall to hold the mould is the primary work, and then hot liquid gelatine is poured between the backing and the carving.

The process is briefly as follows: The carved surface is thoroughly cleaned and covered with rolls of modeling clay, the outer surface of the clay is smoothed, and a plaster coating or wall built against it. This wall is then removed, and the clay taken away; when replaced, an interval of the exact thickness of the clay will exist, and into this interval is poured gelatine. After twelve hours the gelatine will have attained the consistency of India rubber, and may be peeled off the carved surface. In cases of deep undercutting, considerable force is required to effect this. The gelatine mould is then laid on the wall which supported it in the liquid state, and a plaster cast or facsimile is made. In every distinct operation the greatest care and experience are required, in order that the natural good qualities of the gelatine may be allowed perfect freedom in producing an accurate copy.—*H. H. Cole.*

Paper Roofs.

A roof pronounced superior to that of slate, because of its lightness and other advantages, is now made of fibrous pulp. From this material tiles of any shape desired are formed by pressure under machinery, or by any other method which may suggest itself. Pressed into the designs wished for, the pulp tiles are partially dried, previous to being subjected to a water proof solution. Thoroughly impregnated with the preparation to resist moisture, they are baked to harden them in the water proof mixture. After the baking the tiles are surfaced. To this is added a coating of sand, whereby the pulp is rendered proof against the action of heat or flame. By the use of different colored sands, a variety of tints may be imparted to the tiles, which, after the application of the enameling mixture and sands, are baked for a second time, after which they are ready for use.

Besides the inherent lightness of the pulp tiles, which obviates the necessity of a heavy frame to support a weighty roof, the pulp tile, being tough and not brittle like slate, is far less liable to be broken by blows, stones thrown upon them, or human footsteps. Again, slate tiles cannot be laid compactly together on a roof on account of their brittleness, which prevents their being drawn tightly together by nails. Through the fibrous pulp nails may be driven as close home as in shingles, thereby binding them closely to the bed and together, without any possibility of lateral movement, or being blown away in high winds, as slates loosely nailed on roofs usually are. Nails penetrate the pulp tiles more easily than shingles, and line closer together, being more elastic than wood.—*Nat. Builder.*

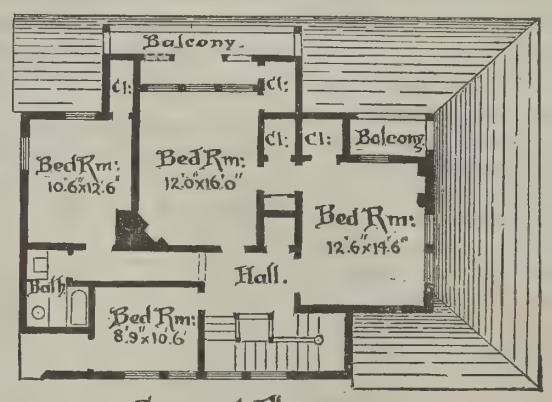


DESIGN FOR A SEASIDE COTTAGE.

We give herewith from our excellent cotemporary, *Building*, a very pretty design by E. L. Messenger, architect, for a cottage for the seaside. It will answer equally well for any other locality. The piazza space is ample, the interior arrangement good, and the design as a whole very pleasing.

Design for a Sea-side Cottage.

First Floor.



Second Floor.

Floors and Ceilings: Ancient and Modern.

BY C. POWELL KARR, C.E, CONSULTING ARCHITECT, NEW YORK.

II.

THE ORIGINAL INHABITANTS.

It is by no means easy to determine the origin of the Japanese race, and latest researches have indicated that it is an amalgamation of several different races. The present Aino tribes of the island of Yesso are supposed to be the descendants of the ancient aborigines of the empire. They were scattered over a great portion of the country, but were gradually driven northward by the southwestern races. The conquering race were the ancestors of the present true Japanese people; but it is insisted by some archæologists that the Japanese are of Chinese origin. They assert that intercourse with the Chinese and Coreans has materially influenced the progress of Japan in the arts, and it is contended that the Chinese civilization is at least two thousand years older than that of Japan; but, if China has had such an early start, they have in the mean time fallen a long way behind the straight-haired race in the decorative arts, and whatever influences have been exerted upon them, they are able to preserve a distinctive character in all their works.

It will be seen from the relationship of the two races of people who inhabit the empire that we have two different types of homes to visit. There is not much difference in the two types, and it is quite probable that the one is the outgrowth of the other.

The earliest Aino buildings were floorless, but the needs of an advancing civilization led to the construction of floors to protect the tenants from dampness and rain. In Japanese buildings all the parts of a structure are held together by a system of "dovetailing," neither metal, nails, nor screws being used in their production, except for ornament. Miss Bird, who has left us the most interesting description of the Aino dwellings, having visited and lived in them for some time, says she is disposed to rank them, in some respects, above their conquerors. In their houses, as in their faces, the Ainos are more European than their conquerors, as they possess doorways, windows, central fireplaces, like those of the Scotland Highlanders, and varied sleeping places. The usual appearance, of which we shall give a plan and perspective drawing in a subsequent installment of this article, is that of a small house built on at the end of a larger one. The small house is the vestibule or ante-room, and is entered by a low doorway, screened by a heavy mat of reeds. It contains the large wooden mortar and pestle, with two ends, used for pounding millet, a wooden receptacle for millet, nets or hunting gear, and some bundles of reeds for repairing roof or walls. This room never contained a window. From it the large room is entered by a doorway, over which a heavy reed mat, bound with hide, invariably hangs. The room referred to was thirty-five feet long by twenty-five feet broad, and another was forty-five feet square. The smallest measures twenty feet by fifteen. These dimensions conflict with the statements of Dresser, Gonse, Audsley, Hildreth, and others, who uniformly agree that all rooms are some multiple of a yard, and that it is the size of the mats that establishes the floor dimensions of every room and the area of every house—that the houses are built to suit the matting, and the matting is never cut to suit the house. This unit mat, as we may call it, and which we shall more fully explain later on, is six feet by three feet. So that if one side of a room is divisible by six or three, the other adjacent side must be divisible by the same numbers.

On entering a room, one is much impressed by the great height and steepness of the roof, altogether out of proportion to the height of the walls, and of too bulky an appearance in comparison to the apparent strength of the supports. The frame of the house is of posts, 4 feet 10 inches high, placed 4 feet apart, and sloping slightly inward. The height of the walls is apparently regulated by that of the reeds, of which only one length is used, and which never exceeds 4 feet 10 inches. The posts are scooped at the top, and heavy poles resting on the scoops are laid along them, to form the top of the wall. The posts are again connected, twice by slighter poles, tied on horizontally. The wall is double, the outer part being formed of reeds tied very neatly to the framework, in small, regular bundles, the inner layer or wall being made of reeds singly attached. From the top of the pole, which is secured to the top of the posts, the framework of the roof rises to a height of twenty-two feet, made, like the rest, of poles tied to a heavy and roughly hewn ridge beam.

At one end, under the ridge beam, there is a large triangular aperture for the exit of smoke. Two stout, roughly hewn beams cross the width of the house, resting on the posts of the wall and on props let into the floor, and a number of poles are laid at the same height, by means of which a secondary roof, formed of mats, can at once be extemporized; but this is only used for guests. The poles answer the same purpose as shelves. Very great care is bestowed upon the outside of the roof, which is a marvel of neatness and prettiness, and has the appearance of a series of frills, being thatched in ridges. The ridge pole is very thickly covered, and the thatch, both there and at the corners, is elaborately laced with a pattern in strong peeled twigs. The poles, for the most part, run from wall to wall, compelling one to stoop to avoid skull fracture and the bringing down of spears, bows, arrows, traps, and other primitive property. The roof and rafters are black and shiny from wood smoke. Immediately under them, at one end and one side, are small, square windows, which are closed at night by wooden shutters, which, during the day time, hang by ropes. Nothing can insult an Aino more than to look into his window.

He is the last person in the world to exhibit an impertinent curiosity in the affairs of others, and he does not understand how it can possess other people. The experience, however, of a certain woman traveling in Japan, upon her first night in an Aino dwelling, rather tends to nullify our statement when the unknown is a foreigner; but we believe it will hold good as to its application to the Japanese in reference to each other.

On the left of the doorway is invariably a fixed wooden platform, eighteen inches high, and covered with a single mat, which is the sleeping place. The pillows are small, stiff bolsters, covered with ornamental matting. A pole runs horizontally at a fitting distance above the outside edge of each, over which mats are thrown to conceal the sleepers from the rest of the room. The inside half of these mats is plain, but the outside, which is seen from the room, has a diamond pattern woven into it in dull reds and browns. The whole floor is covered with a very coarse reed mat, with interstices half an inch wide. The fireplace, which is six feet long, is oblong. Above it, on a very black and elaborate framework, hangs a black and shiny mat, whose superfluous soot forms the basis of the stain used in tattooing, and whose apparent purpose is to prevent the smoke ascending, and diffuse it equally throughout the room. From this framework hangs the great cooking pot.

Household gods form an essential part of the furnishing of every house. Ten white wands, with shavings depending from the upper end, stick in the wall. What a good decorative suggestion is here offered to those who ask, "What shall we do with our 'alpenstocks' when we return from the White or Adirondack Mountains?" Another projects from the window which faces the sunrise, and the great god, a white post two feet high, with spirals of shavings depending from the top, is always planted in the floor near the wall, on the left side, opposite the fire, between the platform bed of the householder and the low, broad shelf invariably on the same side, and which is a singular feature of all Aino houses, coast and mountain, down to the poorest, containing as it does Japanese curios, many of them valuable objects of antique art. No offers can tempt these poor people to sell any of their household antique possessions, and so gold lacquer, pearl inlaying, gold niello work, and daimios' crests in gold continue to gleam in the smoky darkness of their huts.

Except in the poorest houses, where the people can only afford to lay down a mat for each guest, they cover the coarse mat, which Mr. Morse says is similar to the Canton matting which we use in our own homes, with fine ones on each side of the fire.

These mats and bark cloth are really their only manufacture, and this is one of the principal reasons we have for giving an account of it. They are made of fine reeds, with a pattern in dull reds or browns, and are fourteen feet long by three feet six inches wide. It takes a woman eight days to make one of them. In every house there are one or two movable platforms, six feet by four feet and fourteen inches high, which are placed at the head of the fireplace, and on which guests sit and sleep on a bear skin or a fine mat. In many houses there are broad seats a few inches high, on which the elder men sit cross-legged, as their custom is, not squatting Japanese fashion on the heels. A water tub always rests on a stand by the door, and the dried fish, bear, or venison for daily use hang from the rafters, as well as a few skins. Besides these things, there are a few absolute necessaries—lacquer or wood bowls for food and saki or sake or sachi, a chopping board and rude chopping knife, a cleft stick for burning strips of birch bark, a treble cleft stick for supporting the potsherd, in which, on rare occasions, they burn a wick with oil, the component parts of their rude loom, the bark of which they make their clothes, the reeds of which they make their mats. No iron enters into the construction of their houses, its place being supplied by a remarkably tenacious fiber. We shall now approach the modern dwelling, and also look into a Japanese shop or store.

(To be continued.)

Moulds for Romano-British Coinage.

It is very well known to numismatists that moulds of baked clay, made for the purpose of casting coins, have been found in various parts of this kingdom. These moulds consist of flat pieces of clay, having on each side an intaglio impression from a Roman coin; these are placed over one another, generally in three piles; through the raised rim of each mould a small notch is cut, which is turned toward the center of the three piles; the whole is then inclosed in a case of clay, contracted at the top, so that the external appearance resembles a common stone bottle. The melted metal is poured into the neck of the bottle, passes down the hollow space left in the center of the three circular piles of mould, and thence through the notches in the rim of each mould into the moulds themselves. The whole mass is then broken up, the metal is separated from the moulds, the edge of each piece is carefully cleaned and polished, and thus are false coins rapidly and cheaply constructed. It cannot be doubted that coins so formed are forgeries; but the question has been much discussed whether they are private or public forgeries. From an examination of very many of these moulds, many of them arranged within the bottles ready for use, some also still unseparated, with the metal remaining within them, it is evident that they were formed from coins of various types, and even various emperors; and from coins also in various states of preservation, some fresh and sharp, some partially worn by use. The forgeries, therefore, would not resemble a recent issue of coins of the emperor then reigning, but the general mass of coins, of past as well as present emperors, which were in ordinary circulation at the time in the locality where these pieces were made. Under such circumstances, the pieces would carry with them no indications of the place of their birth; pieces made at Lincoln might have been cast in moulds formed from coins struck in London, at Treves or Constantinople, or any other parts of the Roman empire. It is not necessary here to discuss the question by whom these pieces were made, especially as there are not any records to which we can refer for authority, and either side must be supported by arguments deriving the whole of their force from the ingenuity of the combatants, unsupported by evidence. It may only be stated in favor of the practice having been connived at, if not authorized, that these moulds are generally found in the sites of large stations, dispersed over a large surface of ground, and in considerable quantities, leading to the opinion that the operations were conducted more generally and openly than would be consistent with an illegal act which would subject a culprit to severe punishment.—*E. Hawkins.*

Built-up Doors.

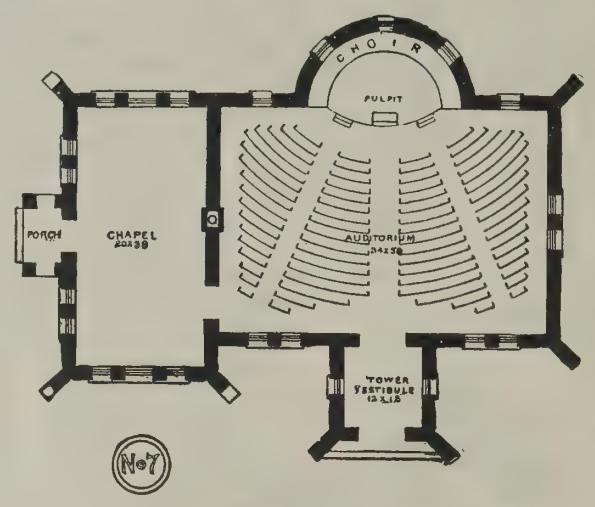
A feature of the building trade is the extensive use that is made of veneers. The method of building up doors of strips of pine has tended directly to this result. The built-up door made of strips of pine glued together is stronger than any other kind, at least of equal weight, and will not warp. But it necessitates the use of veneers of some kind. For heavy doors, quarter inch stuff is used; but for smaller doors in residences, one eighth inch is often considered thick enough. The kind of wood depends on the finish of the room. Mahogany, cherry, oak, and curly or bird's eye maple are perhaps the most common. This method of construction is particularly valuable where the opposite sides of doors have to be finished differently, to correspond with the rooms which they respectively face. This has often been done by making the door of two layers, generally of equal thickness, the unequal shrinking and swelling of which would twist the door, and often ear it to pieces. The objection is raised against veneering that it is dishonest, and so not true art. That criticism should never be made in regard to such work as that mentioned. The built-up door of pine, veneered with mahogany, costs about as much as one of solid mahogany, and is a better one.

DESIGN FOR A $5,000 CHURCH.

This design is modeled after some of the old English country churches. C. A. Dunham, architect. Its location should be upon a slight rise of ground, about as represented in the plate, with an abundance of space around it. When all is completed, let the ivy be planted and cared for, and in a few years it will present a picturesque appearance.

It is intended to be built of rough stone, dressed only around the doors and windows.

The capacity is 250 sittings.



Building to be warmed by steam and properly ventilated.

The windows fitted with stained glass.

Open timber roof and ceiling, walls decorated in an appropriate manner.

The cost of this structure need not exceed $5,000.

Staining Wood.

The following are recipes for staining wood, which are said to be used in a large establishment on the Continent with great success:

Light Walnut.—Dissolve 3 oz. permanganate of potash in six pints of water, and paint the wood twice with the solution. After the solution has been left on the wood for from five to ten minutes, the wood is rinsed, dried, oiled, and finally polished.

Light Mahogany.—1 oz. finely cut alkanet root, 2 oz. powdered aloe, and 2 oz. powdered dragon's blood are digested with 26 oz. of strong spirits of wine in a corked bottle, and left in a moderately warm place for four days. The solution is then filtered off, and the clear filtrate is ready for use. The wood which is to be stained is first passed through nitric acid, then dried, painted over with the alcoholic extract, dried, oiled, and polished.

Dark Walnut.—3 oz. permanganate of potash are dissolved in six pints of water, and the wood is painted twice with this solution. After five minutes, the wood is washed, and grained with acetate of iron (the ordinary iron liquor of the dyer) at 20° Tw. Dry, oil, and polish as usual.

Gray.—1 oz. nitrate of silver is dissolved in 45 oz. water, and the wood painted twice with the solution; afterward, the wood is submitted to the action of hydrochloric acid, and finally washed with ammonia. It is then dried in a dark place, oiled, and polished. This is said to give remarkably good results on beech, pitch pine, and poplar.

Black.—7 oz. logwood are boiled with three pints of water, filtered, and the filtrate mixed with a solution containing 1 oz. of sulphate of copper (blue copperas). The mixture is left to clear, and the clear liquor decanted while still hot. The wood is placed in this liquor for twenty-four hours; it is then exposed to the air for twenty-four hours, and afterward passed through a hot bath of nitrate of iron of 6° Tw. If the black, after this treatment, should not be sufficiently developed, the wood has to be passed again through the first logwood bath.

A DWELLING OF MODERATE COST.

This attractive little house was lately erected for Mr. Edwin A. Burgess, at Buttonwood, R. I., from the designs of Mr. C. F. Wilcox, architect, of Providence, R. I.

The foundations and chimneys are built of brick on a stone foundation, the cellar being six feet deep. The frame of the house is of spruce, boarded with hemlock, trimmings and clapboards of first quality pine, and the soffits and other parts not exposed to the weather are of second quality. Shingles are of cedar, shaved on the roof and sawed on sides. Piazza and balcony floors 1⅛ inch matched hard pine, and the ceiling over same matched and beaded pine. Gutters, valleys, and piazza roof are tinned with first quality M. F. tin, while the conductors are three inches in diameter, of corrugated galvanized iron.

The sashes and doors are 1⅜ inches thick, and the outside doors 1¾ inches. The floors are of spruce throughout, excepting in the kitchen, servants' bedroom, and closets, which are of hard pine. Staircase is formed with returned nosings, and is provided with 1¾ inch balusters, four inch posts, and three inch ash rail. The trim is of ordinary stock patterns throughout.

The painting includes three coats for all outside work, including the shingles, three coats of metallic paint on tin roofs and gutters, and all inside pine work two good coats of paint, the knots, shakes, and defects being properly shellacked. The hard wood is finished with three coats of shellac and rubbed down.

The residence forms, on the whole, a very compact and convenient one, and costs to build about $3,000.

Heating by the Combination of Warm Air and Steam.

In our description of this excellent system of heating given on page 92 of our last issue, the name of the manufacturers and inventors was given incorrectly. It should have been Messrs. Weir & Nixon, 1410 and 1412 North Sixth Street, Philadelphia, Pa., who inform us that they will be glad to give any of our readers interested in the subject whatever further explanation may be required.

A COUNTRY CHURCH.—C. A. DUNHAM, ARCHITECT, BURLINGTON, IOWA.

WESLEYAN CHAPEL, WHITMORE REANS, WOLVERHAMPTON.

The design for the above, which we illustrate, was selected in competition, and was prepared by Mr. Charles Bell, F.R.I.B.A., of Dashwood House, New Broad Street, London. A somewhat novel treatment of plan was adopted, viz., that of a nave and triple transepts, the effect of which, both internally and externally, is very satisfactory. The chapel is planned to seat 530 on the ground floor and 230 in the galleries —total, 760. The walls are built in parpoints, with Codsal stone dressings. The columns supporting the nave arcade are of red and gray granite. The sittings are of selected pine. The roof is open timbered, with hammer beam principals. The windows are filled with quarry glazing executed by Mr. Brewster, of Maitland Park, London, the front window being of special design. The builder was Mr. Thomas Moss, of Stafford, and Mr. Davis, of Walsall, acted as clerk of works. The total cost of the building has been about £3,500, or $17,500.—*The Architect.*

Shelter Belts and Hedge Screens.

What to plant is a question that some may desire to have answered. The very wealth of material before us greatly enhances the difficulty of making a response. We have deciduous trees that are bare in winter, when shelter is most needed, and we have also evergreens in great variety, that retain their refreshing verdure all through the year, and provide the most perfect shelter. For the wind breaks of the field, and even for groves about buildings, the leafless trees have much value, and their judicious disposition will greatly check the cutting storms. The wind, after sifting through the branches, is reft of half its power for evil. Nor is its force restored for some distance. The majority of wind breaks are composed of deciduous trees, and usually of the commonest species—anything that will rapidly grow into a tree, or that can be most cheaply procured. This practice need not, however, prevent us from using any of the more valuable hard wood and other trees in making shelters, but, in some instances, our impatience may prevail over our judgment as to the more valuable species, and induce us to plant only those of rapid growth to insure a speedy result. As to the use of evergreens in outside shelter belts, though more expensive at first, a smaller number and a narrower surface devoted to the wind break will prove so much more effective than a wider strip of deciduous trees as to justify the increased outlay. Sometimes even a single row of Norway spruce, or of hardy pines, like the Scotch or the Norway spruce, or even of the common red cedar or arbor vitæ, will make an admirable wind break. Plant any of the many trees at your command, and plant them where they will produce the desired protection. Whether you select the so-called cheap trees, such as white willows, poplars, soft maples, etc., or whether you choose oaks, hard maples, the white ash, the elm, the wild cherry, the tulip, the walnut, and hickories, or hardy evergreens, do not neglect the planting of these invaluable aids to good culture. When we come to a selection of the plants best suited to the protection of our homes and their surroundings, we again find abundant material from which to make choice. For trees and for tall screens the favorite with many will be the Norway spruce, which grows rapidly, is easily transplanted and managed, and which presents a welcome tint of green that is always persistent and full. The other spruces are also desirable, particularly the white and the black. They all bear the knife and shears very well, and may easily be kept within due bounds when used as hedges for shelter. The native hemlock is particularly commended standing alone, but it is also one of the very best species for forming a screen or shelter hedge, as it may be clipped to a perfect plane, and, when necessary, it can be confined within narrow limits. In the case of trees to be planted about buildings, we should consider their beauty, and, with this character in view, we should select, among evergreens, the hemlock, the white pine, perhaps also the red pine, or Norway, but not the Scotch fir, nor the Austrian. There we may also place the American arbor vitæ, but the especial function of this species is the formation of shelter screens and hedges, for which it is particularly well adapted, except in very dry soils. Nothing can be prettier than a well trimmed hedge of arbor vitæ, unless it be one of hemlock, as the latter preserves its deep green hue unimpaired all winter. Some of the dwarf pines may also find a place in front or at the sides of the house, but they never attain sufficient size to make much shelter. The same is true of the beautiful retinosporas from Japan, which answer well for low screens, and are highly ornamental. The common red cedar is, after all, a most useful plant. It has been called the poor man's evergreen, on account of the facility with which it may be produced in all parts of the country, as well as the certainty and rapidity of its growth. Though not of so fine a color as some others, this tree makes dense foliage when set as a shelter belt and wind break. It also makes a close hedge to screen pathways.

The ground for the wind breaks should be well prepared. A strip of one rod in width will be needed if it is proposed to plant but a single row, and several rods wide must be prepared if it be designed to plant a good wind break of many rows, which is the better plan. After harrowing the ground a furrow is struck for every row of trees, and these furrows may be four feet apart, for then the plants may be set every four feet. This requires very little labor, unless large trees are selected, and if these be large evergreens they need not be so close, but more care will be required in planting. Yearlings and two year old plants of most deciduous kinds, or stout cuttings of willows and poplars, will be the cheapest and best. The young trees, when planted with reasonable care and well fixed in the soil by pressure of the foot, will be sure to grow, but so will weeds, and the plantation must be cultivated for about two seasons, so as to keep down all intruders. With this treatment their growth is greatly enhanced, and they will the sooner shade the ground, when they will suppress the weeds and take care of themselves. They must, however, be protected from the inroads of stock of all kinds. This is an absolute necessity. When to plant, though an important question, need not detain us long. Plant when you get ready, autumn or spring, but be sure to have the soil ready for the reception of your trees before bringing them on to the ground. Let it be dry enough to crumble. Never plant when it is wet and clammy. Deciduous trees may be set out in autumn, when we have leisure to do the work, and when the soil is dry and warm.—*Rural New-Yorker.*

Building Construction in Winter.

The prosecution of masonry work during frost would appear to be plainly undesirable, even if it were practicable to make mortar and cement with freezing water. In Berlin, where a paternal government thinks for everybody, a police ordinance was some time ago issued to forbid bricklaying when the temperature falls to 26° Fahr. This order being based on the assumption that at the temperature named mortar freezes but does not set, Herr Krause, an architect of Stropp, sent a communication to the *Baugewerke Zeitung* to show, from his experience, that the order in question was unnecessary.

Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very sharp frost; the temperature being down from 14° to 23° Fahr. The bricks and sand were frozen, and the workmen had great difficulty in setting the bricks, the mortar freezing under their hands. It would have been much too expensive an operation to warm all the materials previously; and so the lime was slaked in small quantities at a time, and mixed hot—the brickwork being liberally pointed. He naturally expected to find the work perishing in the spring; but he was mistaken—the mortar continuing as firm as if it had stood for several years. The same building was pulled down in 1880, when the mortar was found to be so good that the bricks broke, and could only be cleaned with great difficulty.

Herr Krause subsequently had outer pointing done at several degrees of frost; and always found that if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. If frost attacks freshly used mortar, and continues for some time, the mortar is benefited rather than otherwise; but it is different if the frost gives way to a thaw in a few days. Herr A. Klemm, of Stuttgart, entertains the same opinion; citing in proof the brickwork of the Prussian House of Deputies, built in the winter of 1848–49 during a most severe frost. Hydraulic lime, freshly slaked, was used; and in 1867, when some alterations were required, wedges and hammers had to be used to break up the work. Throughout Wurtemburg it is the general opinion that sharp and long-continued frost improves brickwork and plastering, and other German authorities testify in the same strain.

ST. AUGUSTINE, FLORIDA.

This ancient city, the oldest in the United States, founded by one of the bravest and most celebrated of the Spanish knights, was visited, on the 12th of April last, by a conflagration which resulted in financial losses estimated at a quarter of a million dollars and the destruction of the time honored cathedral, a loss which is irreparable. The fire broke out in the St. Augustine Hotel, which was soon in flames, as were the Edwards House, the Cottage, the Planters' House, the Florida House Annex, the First National Bank, the old Spanish cathedral.

The roof caught and soon fell, destroying all the old historic relics in the interior. The old chimes fell, too, their last work being the alarm which summoned the citizens to the scene of conflagration. By great effort the bishop's house was saved. In addition to the foregoing, the flames reached the Sinclair Block, in which were the stores of Gonzalez & Benhayon, Moy Yong's restaurant, Vedder's museum, Buck's restaurant, Davis' barber shop, Goldering & Co.'s cigar factory, and Speizegger's drug store. All were completely destroyed. Next Chamberlain's grocery and Mrs. B. E. Carr's dwelling, north of the Sinclair Block, were destroyed. Returning to the west side of the street, the flames reached the old County Court House on the north, which was totally destroyed. The records, however, were removed and saved. Vedder & Compton's store and Welter's restaurant on the west burned also. Here the fire was checked.

The old cathedral, one of the most interesting landmarks in the city, was built in 1793, and was in use for purposes of worship up to the time of its destruction.

PONCE DE LEON HOTEL, ST. AUGUSTINE, FLORIDA.

It historical and antiquarian interest, as the oldest city in the United States, the quaintness of its structures and its atmosphere of mediæval repose have done perhaps as much as its mild climate and beautiful situation to make St. Augustine a favorite winter residence. Ponce de Leon, in his search for the "fountain of youth," made a landing there as early as 1512, at the point where the city was afterward established, but it was not until 1565 that a permanent settlement was made there by the Spanish. The cathedral had in its tower a bell bearing the date 1682. The custom house was formerly the residence of the Spanish governor. The remains of a lighthouse with fortified walls, one of the early buildings of the Spaniards, still exist on Anastasia Island, and traces remain of the two lines of defenses, a ditch and an embankment which stretched across the peninsula. During the two centuries of Spanish occupation the maximum population of St. Augustine was 3,000, besides a garrison of 2,500, and its population is about 3,000. Fort Marion, in which part of the Apache prisoners have been confined during the winter, was completed by the Spanish, having been more than 100 years building. Within the last two or three years St. Augustine has been growing rapidly in popularity as a winter resort, and a great sum of money has been expended upon hotels and other structures for the entertainment of visitors. The Villa Zorayda, constructed for a private residence, out of shell concrete, proved so satisfactory and so harmonious with its antique surroundings that H. M. Flagler, of this city, began last year the construction from the same material of the great hotel Ponce de Leon, the first of a group of notable buildings which was to include the "Alcazar," the "Casa Monica" and other structures of an Oriental type.

Some idea of the size and peculiar architecture of this remarkable building may be gathered by a glance at our engravings, for which and for the subjoined particulars we are indebted to our excellent cotemporary, *The South:*

"Who ever heard of driving *into* a hotel in America, or finding orange groves or flower gardens on its roof, reminding one of the famous hanging gardens of Babylon?

"It would seem there was nothing too costly or elaborate to connect with this remarkable building. The bewildered visitor, after being driven under an imposing archway and across a court wherein are fountains and rare tropical plants, trees and flowers, will alight under a regal canopy, and walking a few steps over a floor composed of variegated marble, will find himself in a rotunda under a dome whose apex is eighty feet above him, with galleries one over the other looking down upon him. Picturesque towers rise 135 feet on either side, affording remarkably fine views, marble staircases lead to the balconies or loggias overlooking the court, where lovers may find many a sequestered nook, or, instead of seeking the gloomy grandeur of one great parlor, may stroll into any one of many elegant rooms off the grand hall and enjoy a tete-a-tete unembarrassed by observation.

"The dining room reminds one of the great banquet halls of Belshazzar, though many times as large, as it will seat over 700 people at once, and vaults thirty-five feet to the ceiling, having circular ends, opening upon wide overhanging balconies.

"The entire structure covers nearly five acres, and contains 450 rooms, most of which have fireplaces. But statistics are tedious, and we only aim to chronicle what is unique regarding the Ponce de Leon. It is safe to say that there is enough of this to provide entertainment for the guest for days and weeks, and when these have passed he will still find new attractions, marbles, mosaics, carvings, terra cotta groupings and balconies before undiscovered, to please his æsthetic soul. Ennui is the bane of the tourist, and the owner has set himself to the task of entertainment by building an Alcazar, or pleasure resort, also of coquina, 250×450 feet, adjoining the hotel, which will include sulphur, salt swimming baths, billiard rooms and bowling alleys, forty shops or bazars for curiosities, and cafe arranged around an open court, and in the grounds adjoining will be lawn tennis and croquet courts. Tourists may in the Alcazar secure first class rooms at less rates than at the hotel proper, while rooms at the Ponce de Leon may be obtained at the same rates as those charged at any grand resort hotel.

"As out door exercise is indispensable, the guests will have the range of twenty-five acres of beautifully kept grounds, including the romantic "Lovers' Lane," an archway of orange trees, formerly belonging to the Ball estate, destined to be the scene of many tender passages.

"Villa Zorayda, a private, elaborate Moorish residence, is opposite the towering hotel walls. Ten thousand car loads of earth have already been used for beautifying and extending the grounds connected with the hotel.

"As everything connected with this hostelry is on such a grand scale, it will not be surprising to learn of its unique water supply. The largest artesian well in existence is daily growing deeper, not for more water, for a flow of 8,500,000 gallons per day is already running to waste, or an amount equal to one-tenth of the capacity of the Croton aqueduct, but soft water is demanded. Now the supply is sulphureous, and while no doubt beneficial as a bath for those afflicted with skin diseases, is too odorous for healthy guests, ablutions or drinking purposes. But what if water *hot* enough to heat the hotel should be secured? The temperature of that flowing is now at 80°, with a steady increase as the bore progresses, so while the supply of pipe and money holds out, it may be that this most remarkable of all projects will result in success."

PONCE DE LEON HOTEL FROM PLAZA, ST. AUGUSTINE, FLORIDA.

How to Finish in Natural Wood.

To finish the interior woodwork in the natural wood, says the *Hub*, first apply any of the modern wood fillers at present in the market, after which sandpaper very smooth, dust off thoroughly, and apply a coat of varnish, which should be allowed to stand until dry; then lightly rub down with ground pumice stone and water, clean off well, and apply a second coat of varnish, which should be treated in the same manner, and a third coat given. When thoroughly dry, rub down with powdered pumice stone and linseed oil. Hair cloth is preferred for the rubbing material. The work when cleaned off will present a dull satin finish, and be thoroughly filled up.

Many prefer hard oil finish to varnish, which has this advantage over the latter, that it is not so liable to scratch or chip, being more elastic in its nature. Whichever is lightest in color should be used, as its effect on the wood will be less liable to change its natural color. The lighter the varnish the less change there will be, the darker, the more change, hence light shade varnishes are always selected for this work.

THE *Sanitary News* recently made a suggestion in regard to keeping the plan of the plumbing in a building in a conspicuous place, so that when the same requires any repairs or alterations, reference can be made to the plan and the same consulted, and thus to a great extent much useless and expensive experimental work avoided. The suggestion is to engrave the plan on a slate slab and build same in the wall of the kitchen, thus making it permanent. Another journal suggests that the plan be painted on the inner side of a door to a closet. Either plan will suffice for the purpose, and the suggestion is one that deserves attention in the building of all classes of houses.

Although copies of the general plans are frequently preserved by owners, it is very seldom that they are turned over to the purchaser of a house when it is sold. To adopt the idea suggested above would incur very little expense, and will undoubtedly be favorably indorsed by all architects, when the fact is taken into consideration that this particular part of the work will probably require attention in after years, when the architect is no longer in charge of the work, and, therefore, would most likely not be consulted. Then his plan is there, and his original ideas can be seen.

PLANING MILL CONSTRUCTION.

The first thing to be considered is the selection of the site. This matter should be weighed carefully, as the success or failure of the enterprise depends to a great extent on the facility with which material can be placed in the mill and the product discharged from it. Having settled this point, we begin our foundations, which should be heavy and well built, either of stone or brick, for, in addition to the weight of our machines, we are likely to have several car loads of lumber on the floor, which, in the course of working, are piled first on one side, then the other. The load is thus continually changing, causing the floor to sag unless well supported, thus making our machines stand like a chicken

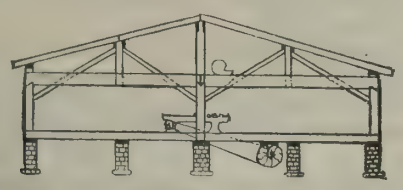


Fig. 1.

in the snow, first on one leg, then the other. It is impossible to do first class work, no matter how good the machine, unless it is well set on a solid foundation. We next come to consider the building. The engine room and shavings vault should be of brick, as a safeguard against fire and frost. The mill proper roomy, and with the least possible number of posts, to facilitate the handling of the lumber from one machine to its neighbor. Sixty feet is a very good width, the length to be governed by the number of machines it is intended to accommodate.

We present here a plan that has been tested with success under the heavy loads of snow of the North, as well as the more genial clime of the South. Fig. 1 is a cross section, showing manner of framing. Side posts are 6 × 8 in.; center post, 8 × 8 in.; purlin posts, 6 × 6 in.; beams, 2 × 12 in. One post on each side is dovetailed in and spiked to braces from main posts to purlins, 4 × 4 in. These pass up between the beams and are well spiked to them. The purlin plates are 2 × 12 in., spiked to sides of posts, their lower edge

Fig. 2.

resting on the main braces. The purlin braces are 2 × 6 in., running up between the purlin plates, to which they are spiked, as shown in Fig. 2.

Fig. 3 shows a plan for raising the center portion of roof when it is desirable to get more light, as in sash, door, and blind factories. The ridge is supported by 2 × 12 pieces, spiked to sides of center posts, and braced in the same manner as purlins shown in Fig. 2. Thus it will be seen it is possible to get a room at minimum cost, 60 × 90 ft. if desired, with only three posts inside, and these located in the center, entirely out of the way.

In these plans it will be seen we locate the line shaft under the floor, which, for several reasons, is preferable to the usual way of placing it overhead. We are able to place the bearings as often as necessary, and near the driving pulleys, where they are most needed. Our driving belts are under the floor, out of the way. There is no danger of men getting hurt by getting caught in them. Machines stand steadier, and belts

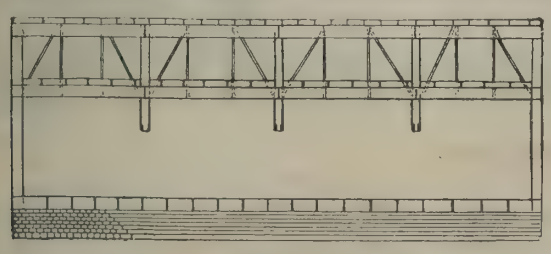


Fig. 3.

grip the pulleys better, as they run nearly horizontal. Thus we are able to run them with less tension, making them last longer, also reducing the tendency of loose pulleys running hot—a source of much annoyance and loss of time.—*The Timberman.*

Bursting of Lead Pipes.

A paper was recently read before the Glasgow Philosophical Society by Mr. George C. Thomson, F.C.S., on "The Bursting of Leaden Water Service Pipes by Water Pressure and Frost." The general impression, he said, was that a pipe burst after a thaw set in, being caused by the ice in the pipe melting, and the pressure thus becoming too great for the strength of the metal. Mr. Thomson gave a number of facts to refute this idea. He said that water in changing into its solid form of ice increased in bulk by 10 per cent, and this led to a pipe bursting. He asked the question at what pressure did a pipe burst, and in answering it said that the rules of the Glasgow Corporation Water Works specified only the weight of the pipes, and, unless otherwise agreed upon, they stated nothing as to the strength or quality. In order to have some idea of the strength of pipes, he had tested various sizes, from ½ inch up to 1½ inches, and found the bursting pressure of the former was 1,820 lb. and of the latter 812 lb. One would naturally suppose that the strength of the various sizes of pipes would be on an equality, or nearly so; but this was not the case, as the ½ inch pipe only burst at more than double the pressure the 1½ inch pipe did.

TIN ROOFING.

We have pleasure in referring to the well known and enterprising firm of N. & G. Taylor Co., who are so widely recognized for their integrity and the quality of

GRAND UNION DEPOT, INDIANAPOLIS.

their goods. This house, which is one of the oldest in the United States, having been established in 1810, has lately obtained a most important and extensive contract for covering the fine depot now in process of construction at Indianapolis, for the Union Railroad. This building, of which we show a view, is thus referred to by the Philadelphia *Press:*

The contract for supplying the tin for roofing the Grand Union Station, at Indianapolis, has just been awarded to Messrs. N. & G. Taylor Co., the well known tin plate and metal importers, of Philadelphia, Pa. It is of so large a magnitude that it forms the topic of general conversation among the trade. Fifteen prominent railroads will center in the immense structure, the total cost of which will exceed $1,000,000. The depot proper and baggage rooms will be 150 feet square and the train sheds, adjoining the depot, some 750 feet long by 190 feet wide. The building will be composed principally of glass, iron, and dressed stone of artistic shape and design.

The plans were designed under the supervision of Mr. Thomas Rodd, engineer and architect for the Indianapolis Union Railroad Company, at Pittsburg. The tin work on the buildings will be done by Mr. Thomas W. Irwin, of Allegheny, Pa., and Messrs. Carpenter, Annear & Co., of Louisville, Ky.

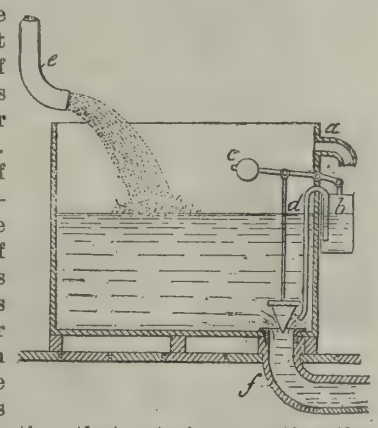
The award to Messrs. N. & G. Taylor Co. is for their "Old Style" brand of roofing. It is claimed to be the best roofing tin in the market to-day. Every sheet is made by the old manner of hand dipping, as first made in Philadelphia in 1830, and sold by this firm. It is thus called the "Old Style" double coated and redipped. It is said to outlast any other roofing made.

To fulfill the present contract it will take some 500 boxes of the 28 by 20 inch size ternes, there being in all some 150,000 square feet of surface. This is the largest contract ever awarded for so fine a grade of roofing plates, and it is a significant fact that in this age of deceptions, cheap qualities, and imitations, especially in roofing tin, so decided a preference should be expressed from so high a source in favor of this firm's brand over all competitors.

This same brand of roofing was selected by the Board of Guardians of the Poor to conver the Blockley Almshouse, in West Philadelphia, some months ago. Some 200 boxes were used there. Wherever the tin has been brought to the notice of practical men, unbiased by any political favoritism or otherwise, it has met with favor, and many instances could be mentioned in every prominent city and town in the country where this fine brand has been chosen over all others, on account of its superior quality.

RESERVOIR WITH AUTOMATIC VALVE.

The figure represents a new system of water reservoir with an automatic valve. The water enters the reservoir through the pipe, *e*, and, when it reaches the level of the spout, *a*, flows through the latter into the vessel, *b*. When the weight of this vessel counterbalances that of the counterpoise, *c*, of the lever and its valve, the latter rises and allows the water to flow out through the pipe, *f*. As the liquid flows into this

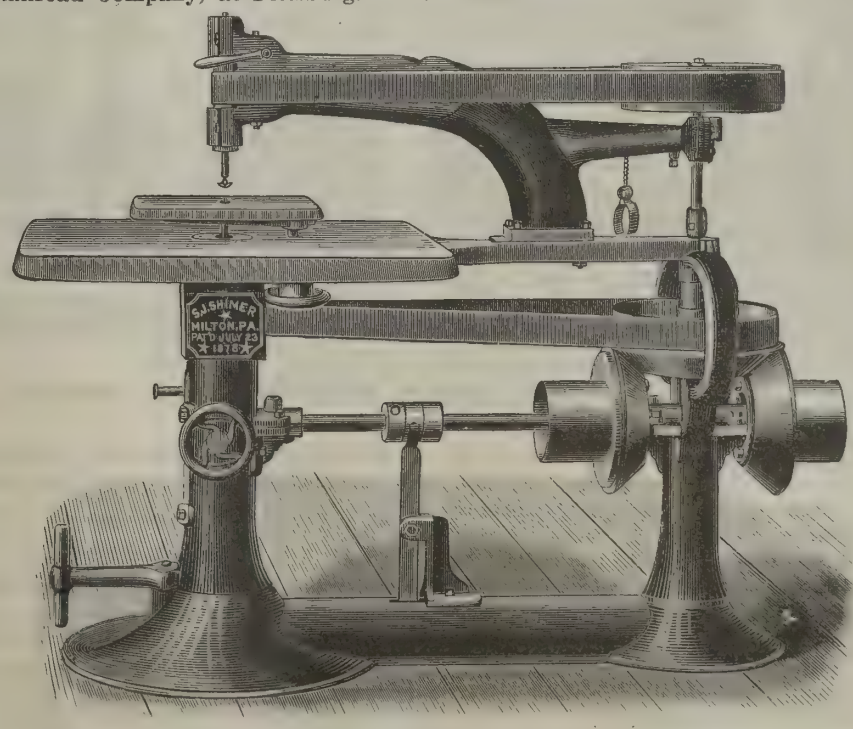


pipe, it creates a suction that sets in operation the siphon, *d*, which empties the vessel, *b*. This latter then drops and causes the lever to place the valve on its seat again.—*Revue Industrielle.*

IMPROVED VARIETY MOULDER.

Among the most useful tools for the planing mill, the woodworker, and the furniture factory are the patent variety moulders of Samuel J. Shimer, of Milton, Pa. These are made in several different sizes, styles, and weights, of which we show the one designated as "No. 6." This is a useful, compact, and very serviceable machine, fitted with all the latest improvements, the chief of which is that it may be used for both countersinking and edge moulding. The former is effected with a pattern guided by a pin, which automatically takes its position when the machine is started, and drops out of the way when it is stopped.

When it is desired, the machine may be quickly changed from a surface moulder to a variety moulder, by adjustment of the parts and by raising the arm. There is no necessity, in making the change, either to unbolt or lay away any part, which is a considerable improvement of itself on the old fashioned style of machines.



IMPROVED VARIETY MOULDER.

But the completeness and simplicity of the tool, and the accuracy and rapidity of its work, are its chief qualities, and render it one of the finest machines of its kind on the market.

Costs of Different Kinds of Walls.

The following, from the *National Builder*, shows the comparative cost of frame, brick, and stone walls.

The first idea that naturally suggests itself, after the general plan of arrangement has been perfected, is what material shall mainly enter into the construction of a building—brick, stone, or wood. In nearly every portion of the Eastern, Middle, and Western States, these three building materials can readily be had, and the cost of production does not vary much in any locality. Assuming, therefore, that the first cost is the same in the above localities, we may easily arrive at the ultimate cost of construction. For the purposes of this article, we may assume the cost of good common brick, during the summer, to be $8 per thousand; cost of labor and mortar to lay the same in wall, $4 per thousand, wall measure. The cost of good quarry stone, assumed at $10 per cord; the cost of labor and mortar to lay the same in wall, $8 per cord of one hundred feet. The cost of framing lumber, $12 per thousand feet; labor and nails to put same up, $6 per thousand. With these prices as a basis, it is a matter of computation only to arrive at the proportionate cost of each material after it has been worked into the walls. As an example, suppose we have ten feet square of plain wall to build, what will be the comparative cost? Ten feet square equals one hundred superficial feet. If to be built of brick twelve inches thick, estimating 22½ brick to the superficial foot, would take 2,250 brick; cost in wall per thousand, $12, equals $27.

To lay a good rubble stone wall, it should be 18 inches thick, therefore 10 feet square, or 100 superficial feet, of stone wall 18 inches thick, at $18 per cord of 100 feet, would cost $27. In estimating a frame or studded wall there should be included, first, the studding, say 2×8, 12 inch centers; second, the outside sheathing of 1 inch surface boards; third, the siding of clear pine. For this example we have placed the cost of rough lumber at $18 per thousand, put up. We will assume the cost of the inch surface boards for sheathing to be $25 per thousand, including labor, nails, and material. Siding at $40 per thousand, including lumber, labor, nails, and waste. Ten feet square, or 100 superficial feet, of 2 × 8 studding, at $18 per thousand, equals $2.43. The same surface, covered with surfaced boards, at $25 per thousand, costs $2.50; 125 superficial feet of siding, at $40 per thousand, equals $5, allowing one-quarter for lap and waste. Thus we find the total cost of the frame wall to be $9.93. Add to this the cost of painting the same, one square at $3, we find the cost to be $12.93. Comparatively, therefore, we find the cost of 100 superficial feet of wall, built of the three leading building materials of the country, as follows:

Common brick	$27.00
Rubble stone	27.00
Frame	12.93

The cost of window and door frames, cornices, etc., may be estimated about the same in either building. In brick and stone buildings we find the additional cost of cut stone windows and door sills, water table, etc., but the cost of these adjuncts does not enter into the first cost of the walls, and should rather be estimated on separately or considered as additional items of cost that may be dispensed with if necessary.

Imitation Stone.

Excellent imitations of stone, marble, terra cotta, and such like, for the decoration of buildings, for statuary, and other purposes, are produced by the process invented by Mr. D. Cottier, of London. He applies powdered sandstone, freestone, brick, terra cotta, granite, onyx, or marble, sand or dust, to any interior or exterior architectural work, either curved or plain, or to buildings or structures of all sorts, or to statuary or ornaments made with stone, brick, plaster, terra cotta, cements of all kinds, or to stucco or other like compositions.

The powder or sand of any of the above mentioned substances is caused to adhere to the surfaces by means of paint made with oils, spirits, tars, varnishes, or other sticky materials which are insoluble in water. The powder or sand or dust is to be put on by a dredger, or thrown by hand instrument made for the purpose, or by an air blast, or engine driven by hand, water, gas, steam, or electricity, or otherwise. It is claimed that work so done will withstand the wear and tear of climate and weather better than any simple paint, while at the same time the natural and artistic effects gained will be evident to all. By its application to the reproduction of stone or marble statuary and ornaments, the self-same look of the originals can also be given. In these cases the stone or marble would have to be reduced to a very fine powder.

How to Grain Walnut.

It is a very difficult thing to teach graining by essay, for, as experts know, this knowledge can be obtained only by years of practice. We do not profess to be expert on this sort of thing, as it is a little out of our line, still we will do our best.

The groundwork for black walnut should be made of white lead, yellow ocher, Venetian red, and black, and should dry with somewhat of an oil gloss. In order to obtain any degree of perfection in the imitation of burl walnut or any other wood, it is necessary to procure a panel or bits of veneer, and copy the color and form of the grain as nearly as possible. The grain color should be burnt umber.

To grain in oil, mix the grain color in boiled linseed oil and turpentine, and add a little soap or whiting, or both, as it makes the color flow more freely. For distemper color, grind the grain color in ale, beer, vinegar, or whisky (the latter to be preferred in cold weather), the object being to bind the color so that it will not rub off.

Graining should be done with a free and careless motion of the hand, yet having an eye to the character of the wood to be imitated. Glazing colors are transparent, and should be used very thin, whether in oil or distemper color. Blending should be done by brushing the tip of the blender back and forth slightly over the work while it is wet. Blazing, or the light shades, are put in by sliding a blaze stick up, and bearing around to the right or left. The same motion is required in packing in the fine check grain with the side of the blender.

The tools required are a brush to put on color; sponge; buckskin, to wipe out the lights; blender, and top grainer.—*The Hub.*

SHOP FRONTS IN BIRMINGHAM, ENGLAND.—*From the Building News.*

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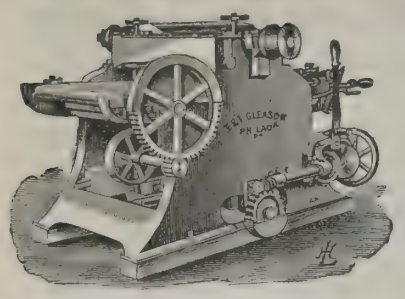

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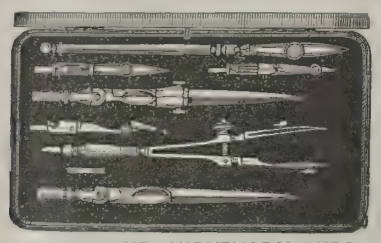

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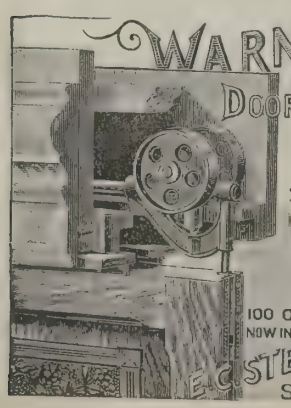

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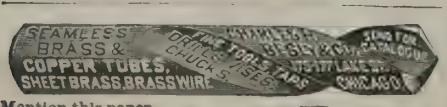

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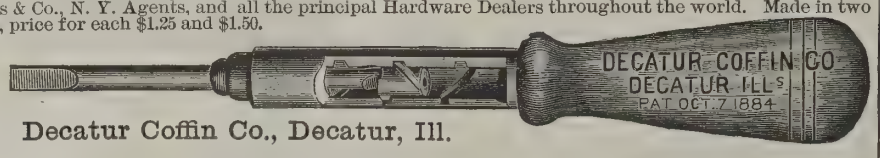

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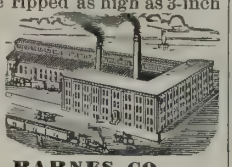

ALEX. SHIELDS, Lima, Ohio, Sept., 1882, says: "A few days since, we had some 150 small drawers to make for drug store; the steam power mill wanted 50 cents each for making them. With my foot power machinery I made them, and saved $25 above good wages on the job."

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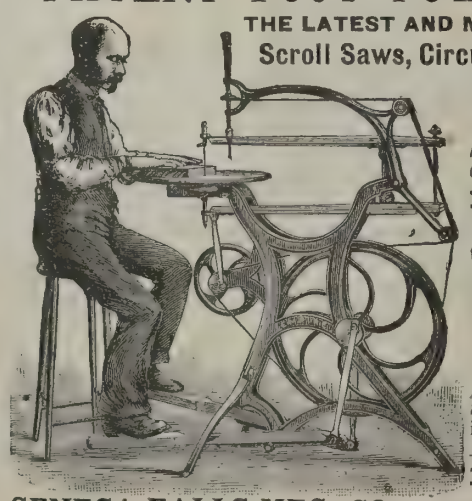

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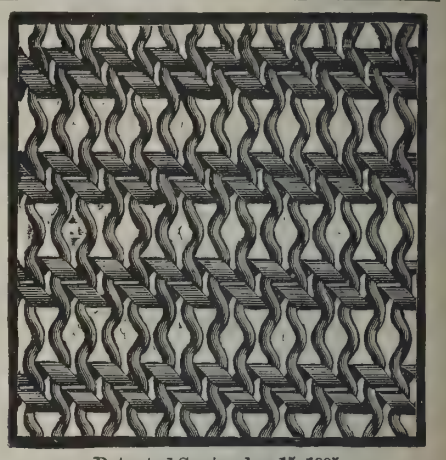

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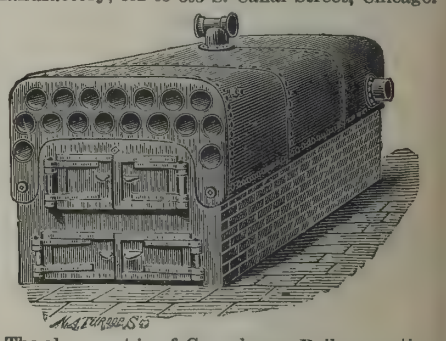

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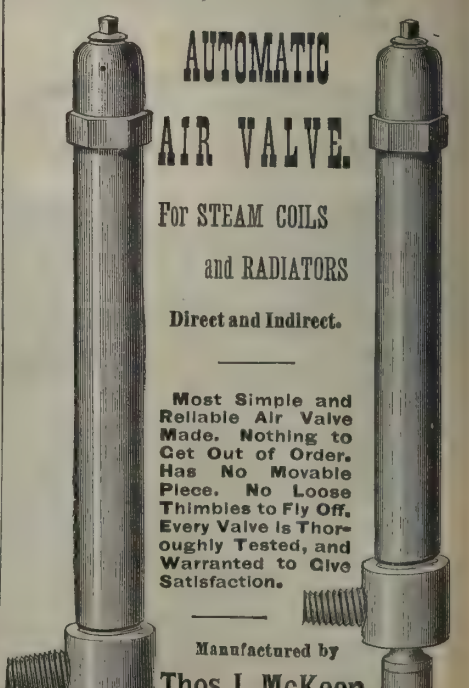

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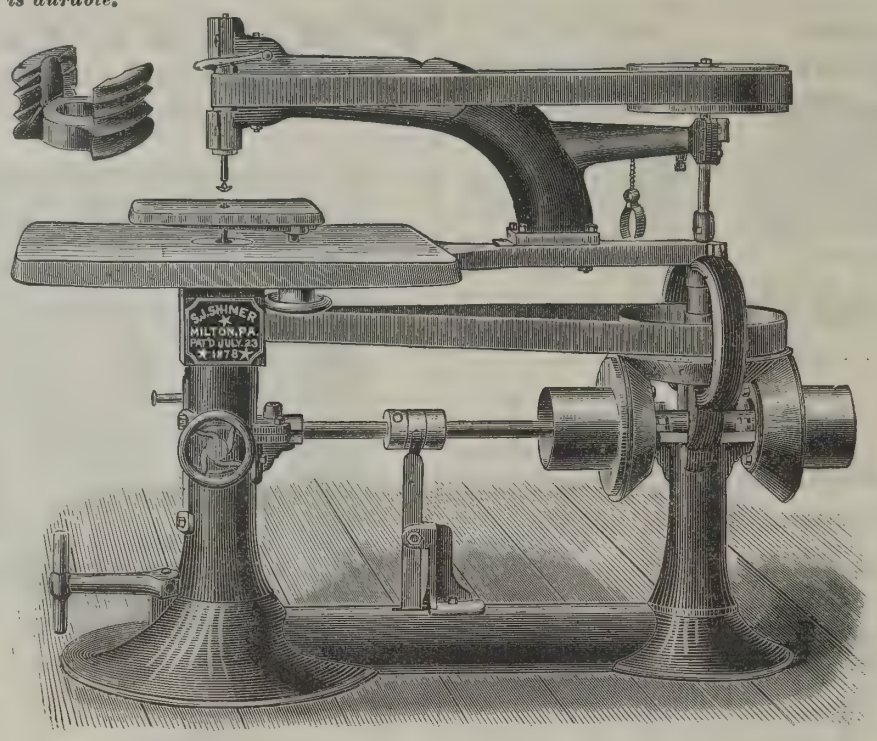

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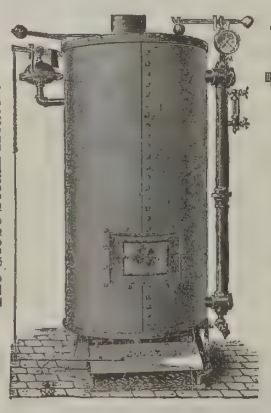

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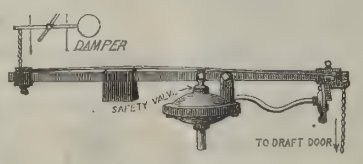

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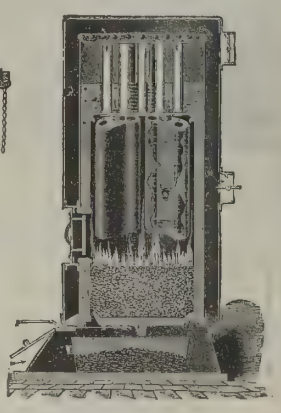

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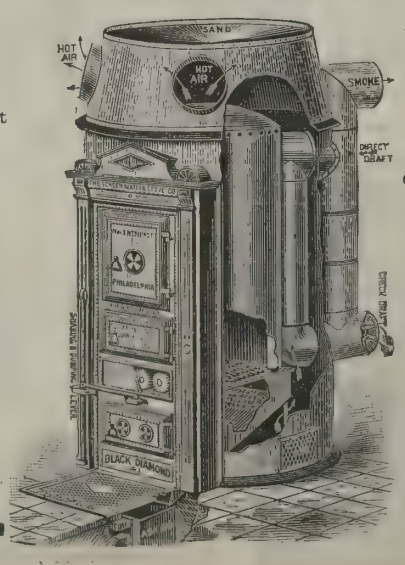

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(1) W. E. P., of Bridgeport, Conn., asks how many pounds of water will a cubic foot of dry granite absorb? A. Good granite will absorb about one-half of one per cent of its own bulk of water. Hence a cubic foot of granite will absorb 0·005 cu. ft. of water, and this, at the standard temperature (62° Fahr.), will weigh 62·355 × 0·005 = 0·3118 lb.

(2) P. L. desires to know how to mix cement so that it will not crack or chip off on the surface. A. This is a general disease of cement pavements, and is due chiefly to impure sand, containing loam, etc., and also to a non-intimate combination of the cement with the sand. The remedy is obvious.

(3) L. J., of Chicago, suggests the use of hinged iron conduits to convey water from a point distant four miles from the shore of Lake Michigan to the city of Chicago, instead of a tunnel and a receiving crib. A. The latter would have to be built in either case. Admitting the possibility of making the hinged pipes, the natural query follows, How could such a system of piping be kept in repair? Leaks or ruptures in an iron main could not be repaired by a diver under water, and as for raising any section of the main after once in position, it would involve such an outlay of money as to more than pay the interest on a permanent piece of work, such as a well built tunnel. Again, the longitudinal strain on the joints would amount to an unknown factor of danger to the whole conduit, and we believe it is an impracticable scheme.

(4) J. B. N., of Shalam, Las Cruces, N. M., asks for a formula for artificial stone or cement, made without Portland cement? A. Artificial stone closely resembling natural sandstone in appearance, strength, and durability, can be made by cementing clean sharp sand with the double silicates of potash and soda. The latter can be prepared by calcining flints in the presence of carbonates of potash and soda, or, better, by the calcination of siliceous limestones. For an artificial cement: Take two equivalents of lime, two of silica, and one of alumina, calcine them, grind to powder and pack in barrels, to be kept dry until used. As soon as it is made into a paste with water, chemical action takes place, a double silicate is formed into a compact artificial stone.

(5) Query submits a drawing of two piers of equal base and height, but under one of them, which he calls "B," he has placed a flooring of 2 in. plank. He desires to know which of the two piers will settle the most, and why. A. The amount of settlement under precisely the same loads will be the same, but the manner of settlement might be decidedly different. The pier B having the timber floor will settle more uniformly than A, because the advantage of the timbering is its resistance to a cross strain with a trifling flexure. Timber footings secure uniformity of settlement, not immunity. Where the piers have a small cross section, stone or concrete footings are preferable to wood.

(6) I. J. M., of Cleveland, O., asks how can a cellar bottom be made waterproof? Cement alone will not do, have tried it. A. The reason it would not do is because the cement was laid in immediate contact with the clay. A good plan is to excavate the cellar about one foot below its present depth and replace the clay thus taken out, either with washed coal cinders rammed down with a heavy maul, or place a layer of broken stone rammed down compactly, or a layer of coarse gravel also rammed. Either one of these methods will insure a good bed for the cement concrete flooring, which can then be put down without any danger of the cement being "killed" by the clay. If the soil is saturated with water and springy, a good under drain is highly necessary to insure complete protection from dampness.

(7) M. U. C., of Vernon, Mich., wishes information in regard to the propriety of mixing water lime with stone lime for plastering. A. Pure or fat limes are the most economical and safe. Hydraulic limes require great care in handling. The only advantage to be obtained in their use is a more uniform setting of the mortar, but the advantage will not compensate for the difficulty in using it.

(8) H. M. B., of Birmingham, Conn., inquires what the safe load per sq. ft. of surface supported by angle iron beams, 2 in. by 2 in. by 3-16 in., spaced 2 ft., and length between supports 10 ft. A. The ultimate uniformly distributed load which such a beam will bear is 1,052·8 lb., and the safe load is 350·9 lb. The load per square foot, as the area called for by the spacing given, is 350·9 ÷ 20 = 17·54 lb. per sq. ft. If the load is concentrated at center of beam, the safe load will only amount to one-half of the above.

(9) W. E. W., of Askada, Mason Co., Wash. Ter., desires to know how to protect iron water pipe from rusting. A. The practice in the East is to have the pipe well galvanized, and then painted with a heavy coat of mineral paint, or to dip the pipe, so as to cover the external surfaces, in coal tar heated to 300° Fahr. Precaution must be taken, however, to thoroughly clean the outside surface before the dipping is done.

(*Continued on page* x.)

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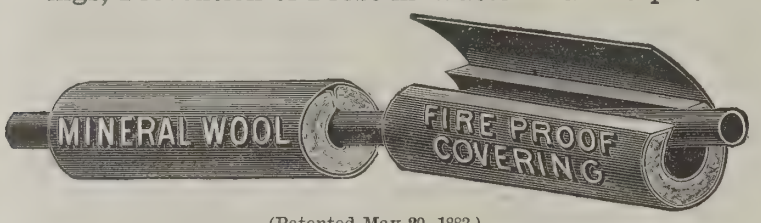

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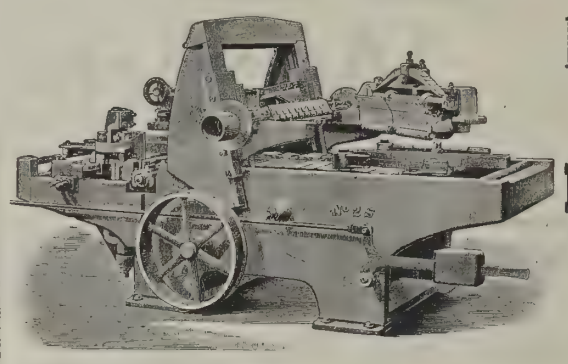

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Notes and Queries.

(*Continued from page* vi.)

(10) J. K. H., of St. Joseph, Mich., asks for a cement to be used in patching up a leaky tin roof. A. The following has been of great service: Equal parts of whiting and dry sand, and 25 per cent of litharge made into the consistency of putty with linseed oil. It is not liable to crack when cold, nor melt, like coal tar and asphalt, with the heat of the sun.

(11) "Stevens" says: Please give me a formula for making a cheap cement for floors and walks, also simple method of paving street with bricks. A. For a cheap floor, lay to a depth of about 2 in. a mixture of 1 part of Portland cement and 6 to 10 parts of short sand. Face up with cement and sand mixed, in the proportions of 1 part of the former to 2 of the latter. A floor or pavement subject to much wear should be covered deeper with the cement. Several other mixtures are given in the Sept. No. of our A. & B. edition. Brick pavements may be formed by laying hard bricks on edge in cement and sand, on a foundation of 2 inches of the cement. The roadbed should be well settled before the cement is applied.

(12) W. H. P. asks: What is the best preparation to put on a kitchen floor? The floor is spruce, and has been painted yellow about four months, but is all worn off, and looks bad. Do you know of any cheap paint that will dry quick and be durable? A. To resist the considerable wear on a kitchen floor, the paint should be of the best quality. A cheap, quick drying paint will not answer. Rub down the surface and give three good coats of some dark color, such as Indian red or umber. These are more durable than the lighter colors. Take care that the floor is perfectly clean and free from dust and grease before putting on the paint, and allow each coat to become thoroughly dry before applying another. The more durable job would be to stain the floor, if you can get off the old paint. To do this mix 2 parts of Vandyke brown and one of burnt sienna with size, and apply with a large brush, taking care to get it well into the grain of the wood. When dry, complete by applying a coat of copal varnish.

(13) J. B. S. asks: What is the best and cheapest roofing paint for shingles, to be painted before they are put on roof? A. We should recommend you to use Rutherford's metallic paint, a most excellent and reliable article.

(14) F. A. D. says: I am building a house, and propose to shingle it, and use the rain water for general use. Would not the creosote stain be apt to make the water taste bad? What would be the best paint to use for the purpose, or would it be better to leave them unpainted entirely? A. The water will be better for general use if you leave shingles on roof without paint. The stain is intended more for the vertical sides.

(15) J. E. C.—A good way to save the old ceiling would be to screw ⅞ by 3 in. strips each way, about 2 ft. apart, or as near as the width of the room will permit. Insert in these panels a neat pattern of paper. Paint strips some warm color, to suit surroundings. This will make a cheap paneled ceiling, and will look well. Strips may be scratch beaded in center.

(16) G. F. B. writes: Will you please give method of oiling shingles before laying? Is it advisable to so treat them? A. It is advisable to treat them with oil before laying. Use linseed oil, put it in a large tub, dip the thick end of the shingle in about 8 inches, and wipe off with brush and let dry about 24 hours.

(17) B. & Co., of Huntingdon, Quebec, ask (1) for a rule to find height of truss to length of span to bear a given load of from 4 to 5 tons. A. There is no established relation between height of truss to length of span, although for a Howe truss bridge the height is about equal to or exceeds one-fifth of the span. 2. Give height of truss for a span of 75 ft. between abutments, with proper size of lower and upper chord, posts, braces, and bolts for a Howe truss bridge, wood. A. Span 75 ft., rise 12 ft., number of panels 10, upper chord number of pieces 3, size 6 in. by 12 in., lower chord number of pieces 3, size 6 in. by 14 in. An end brace, No. 2, size 6 in. by 11 in., center braces two, size 6 in. by 8 in. A counter, number one, size 6 in. by 8 in. End rods two, diam. 2¼ in., center rods two, size diam. 1¾ in. For a load which will not strain the timber to more than 800 lb. per square inch.

(18) G. H. H. asks for a recipe for mixing a paint to imitate cherry. To be used for inside work, and on wood which has before been painted. A. One part of lac varnish mixed with nine parts of ground cinnabar forms a rich colored paint, which answers well for imitating red cherry.

(19) E. K. asks: If you wished to warm a room by steam and the room is closed up, can you not raise the temperature of the room to a higher degree than the temperature of the steam at boiler pressure? Of course, we mean heat by direct radiation through steam pipes? A. You cannot heat a room as hot as the steam at the boiler pressure. In drying rooms for japanned and rubber goods, a temperature is seldom obtained nearer than from 15 deg. to 30 deg. below the temperature of the steam in the pipes.

(20) N. C. R.—The wood mouldings for picture frames are cut in a machine, brushed over with the plaster of Paris, and smoothed down with a steel trowel of the same form as the moulding. The plaster has a little glue mixed with it. For your blackboard to use with chalk use shellac varnish, lampblack, and powdered pumice; mix as a paint, and brush over quickly. For your artificial slate, use shellac varnish, lampblack, and finest flour of emery. Thin the shellac varnish with 95 per cent alcohol, so that the emery will have a cutting surface. The exact proportions you must find by trial.

(21) S. H. B. asks: What is the difference between "quarter" and "bastard" sawed lumber? A. Bastard sawed lumber has the annual rings parallel with the surface in some part of the board or plank, and is the ordinary method of sawing. Quartering is sawing the log into four parts across the center, and then sawing the quarters so that the annual rings will run out to the surface. It is not economical for the lumber producer. Quartered lumber may be made from bastard by culling and sawing out the bastard centers.

(22) T. H. T., Buffalo, N. Y., asks: What will clean fly specks from hanging lamps? A. Old ale is excellent to wash any gilding with. It acts at once on fly specks. Apply with a soft rag.

(23) J. P. asks: Will you please give receipt in your next issue to make a whitewash that will stand the weather, and also what to color with to make a deep slate color? A. Slake ½ bushel lime, strain, and add a peck of salt dissolved in warm water, 3 pounds ground rice put in boiling water and boiled to a thin paste, ½ pound powdered Spanish whiting, and a pound of clear glue dissolved in warm water. Mix these well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used, put it on as hot as possible, with painters' or whitewash brushes. Color to suit by adding sparingly of a dry pigment.

(24) J. J. W. asks: What height and width inside should a brick chimney be made, to give sufficient draught to burn tan bark after being bleached and not dried? Length of boiler being 14 feet over all, tubes 12 feet long, 36 in number, 2¼ inches diameter. Furnace being double, *i. e.*, double the size of an ordinary one. Have you any idea as to what number of bricks it would require to build same? A. About 60 feet high, or perhaps more, according to location for draught, and about 2 feet square inside at bottom. Wet tan burning requires large furnace or oven capacity, and exceptionally good draught. Such chimney will probably take about 30,000 bricks.

(25) J. R. asks: 1. What paper is used in making paper boats? A. The paper is made specially for the purpose, in narrow rolls of varying thickness up to that of a thick cardboard, of flax, hemp, or wood fiber, according to the quality sought. It is laid in successive strips, over a former, with glue or paste. 2. How is papier mache rendered waterproof? A. The waterproofing is generally shellac or a varnish. 3. How are leaves bleached, such as ferns and oak? We have taken the SCIENTIFIC AMERICAN for ten years, and have not troubled you before. A. Leaves are bleached with a solution of chloride of lime and water, about one tablespoonful to a quart of water. Add a few drops of vinegar; subject for ten to twenty minutes, then rinse in clean water, and dry between blotting paper.

(26) H. S. S., Jr., asks: 1. Would it be dangerous, in case of lightning, to run a wire cable from the roof of one block across the street to roof of another, both roofs being tin? A. Unless both roofs are well connected with the ground, the lightning striking one roof might be conducted to the other, thence through the house, doing damage. 2. What result do we obtain by mixing a solution of acetate of lead and a solution of sulphate of zinc? A. A precipitate of lead sulphate.

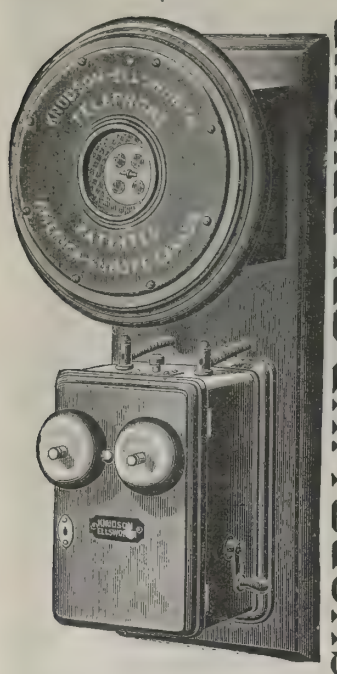
(27) J. G. P.—A corrugated iron roof should be lined to prevent sweating, in places where the air is liable to become moist, or where many persons are congregated. Cover the frame with matched boards, then lay the corrugated iron.

(28) J. P. asks (1) how to take the rust off a bicycle, the rust having been on over a year. I have tried oil and sand, also oil and emery paper. A. Rub with kerosene oil or spirits of turpentine. 2. Also, is there any solution to make steel shine just as if it was nickel plated? A. Nothing except polishing. 3. Also of a solution, when you dip nickel or silver pieces into it, it will gold plate them, without a battery. A. Wash thoroughly a quarter of an ounce of gold chloride; then add it to a solution of 2 ounces potassium cyanide in one pint of distilled water; shake well, and let stand until the chloride is dissolved. Add 1 pound prepared Spanish whiting, expose to the air till dry, and then put away in a tight vessel for use. When applied, it is mixed into a paste with water, and rubbed on the surface of the article with a piece of chamois skin or cotton flannel. The surface of the article should be thoroughly cleansed before the plating powder is applied.

(29) W. F. B.—The trouble with steam tricycles is not with the light engine, but with the heavy boiler, water, and fuel. They have been built in England to run 8 to 10 miles an hour. We do not think you can attach an engine and boiler to any ordinary tricycle that will be of much service. The power stated would no doubt give the desired speed. Fuel, water, and attendance make the trouble.

(30) O. K. writes: 1. I would like a recipe for making a cement (with silicate of soda) for furnaces and stoves. A. This cement is prepared by mixing finely pulverized iron with silicate of soda to a thick paste, and then coating the cracks with it. The hotter the fire then becomes, the more does the cement melt and combine with its metallic ingredients, and the more completely will the crack become closed. 2. A recipe for making a glue for labeling on tin. A. See answer to query No. 21, in SCIENTIFIC AMERICAN, May 9, 1885.

(31) E. B. asks how to make paper for blue prints. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 483, page 7707, for full details.



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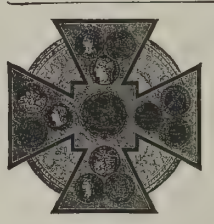

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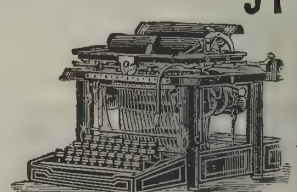

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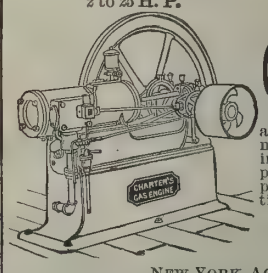

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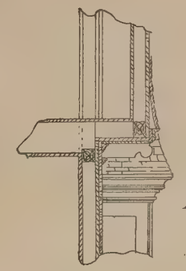
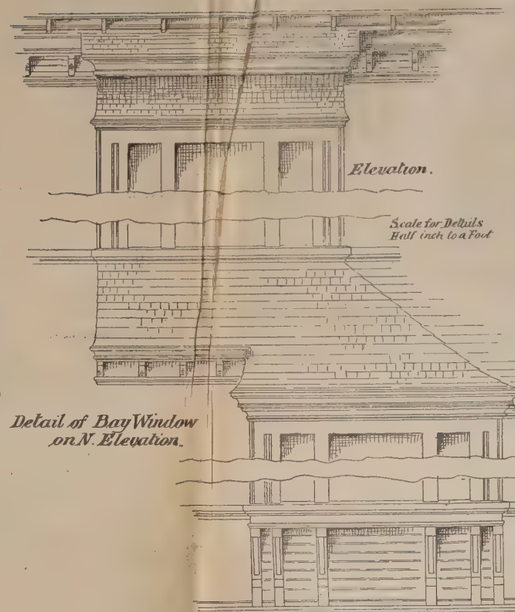
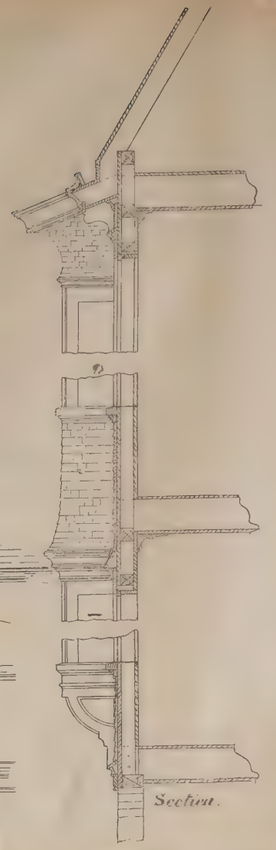
SOUTH ELEVATION

SECTION THROUGH A-B.



Detail of Bay Window on N. Elevation.

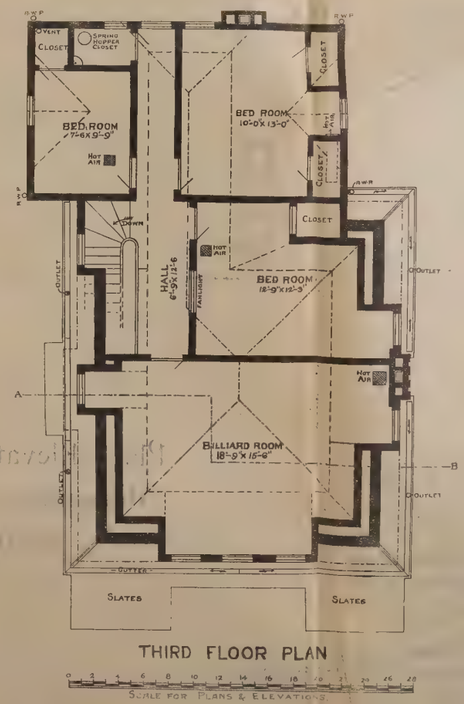




Section.

Detail of Porch & Balcony N Elevation.

CELLAR PLAN.



THIRD FLOOR PLAN

SCALE FOR PLANS & ELEVATIONS

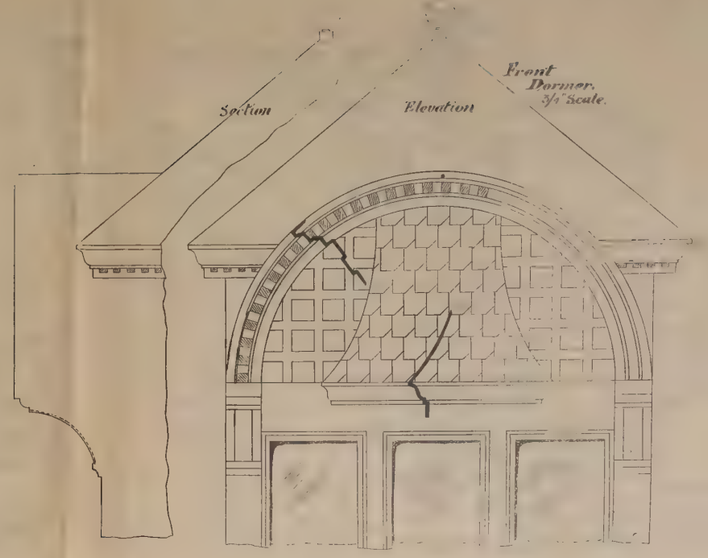
Plans and Details of a House at Orange, N. J.

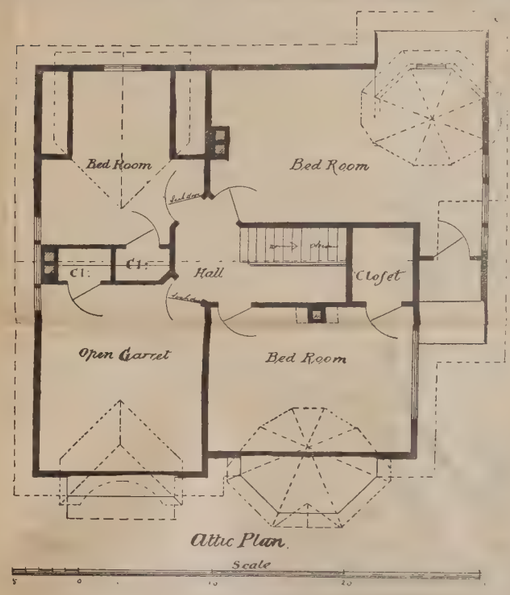
Joseph A. Stark, Architect,
New York City.

Details to accompany Colored Plates. For description see Architects and Builders Edition of Scientific American for May, 1887.

Front Elevation.

Side Elevation.



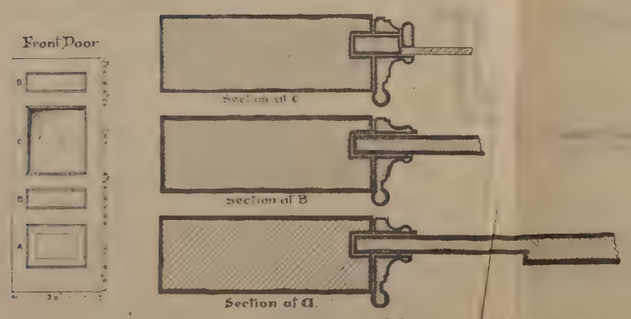


Attic Plan.

Scale

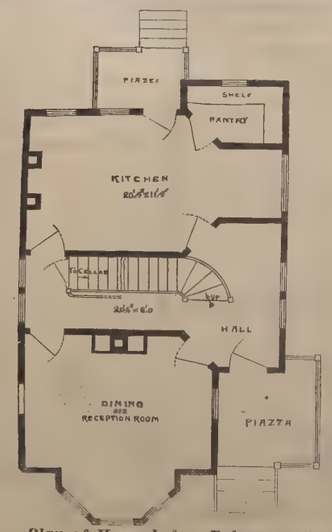
Rear Elevation.

Side Elevation



Plans, Elevations, and Detail Drawings of a House after Enlargement.

Cellar Plan.



Plan of House before Enlargement.

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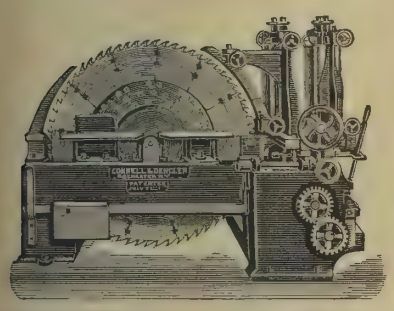

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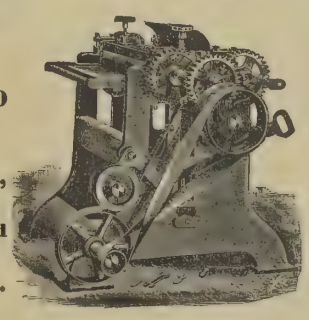

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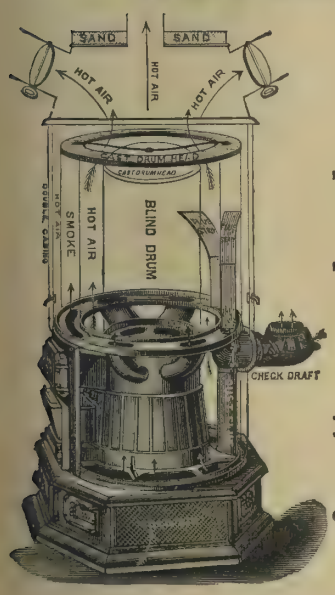

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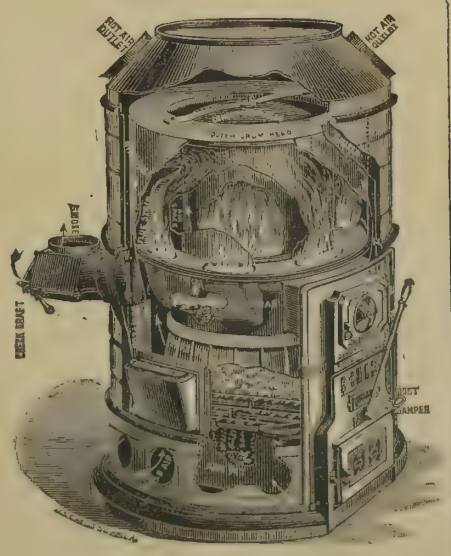

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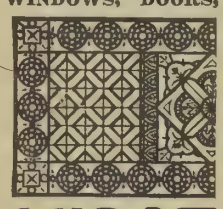

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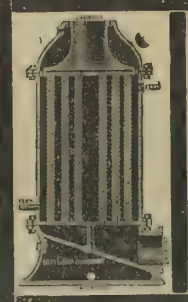

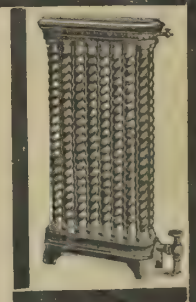

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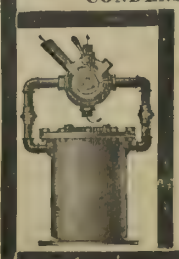

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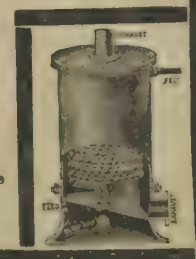

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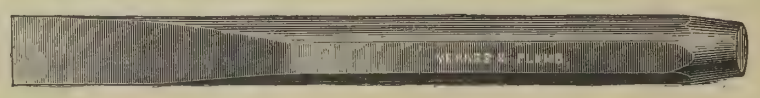

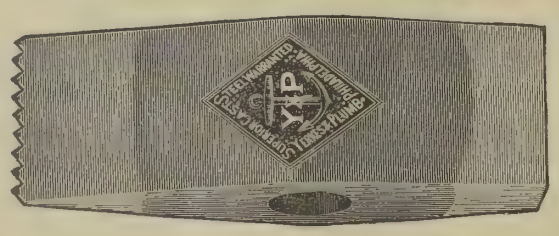

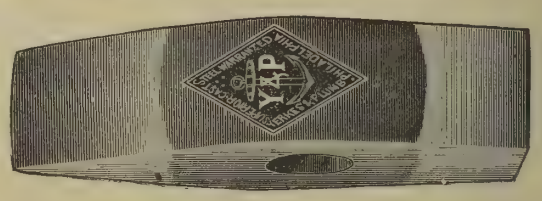

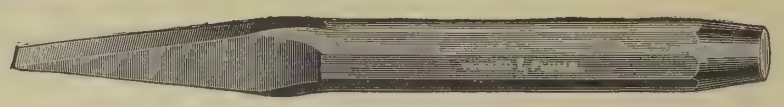

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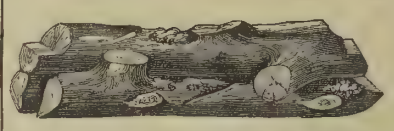

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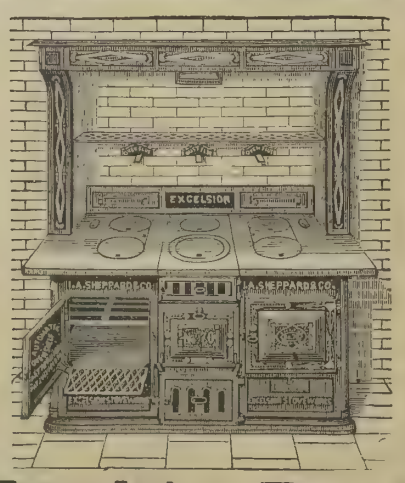

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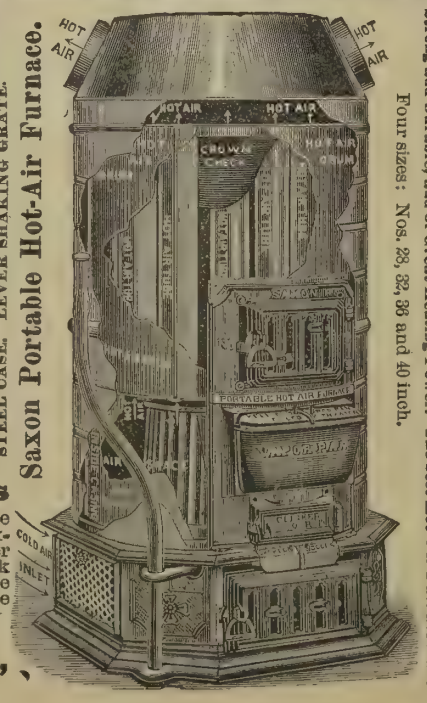

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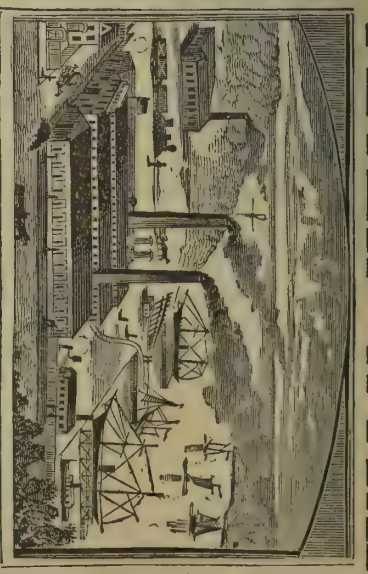

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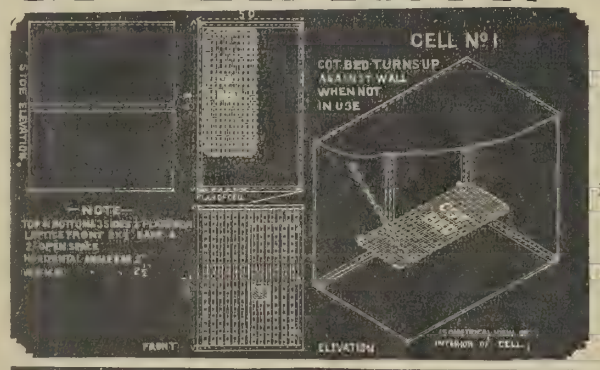

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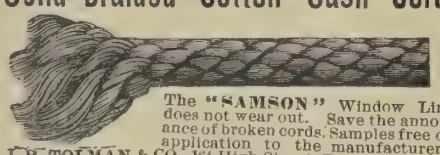

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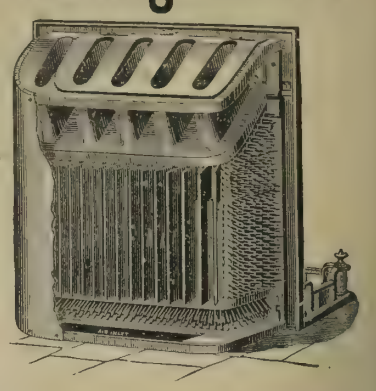

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stumble upon the fact that our best authority upon architecture not only did not take this prescribed course, but was not even a practitioner, or, stranger still, an amateur, he will be sorely puzzled.

Should the student happen to learn of that *chef d'œuvre* of architectural books, Viollet Le Duc's "Discourses on Architecture," he will discover no sickening masquerading with truth and sentiment, but the principles of truth, unity, and beauty, each allotted to its appropriate place, each characteristic of good architecture, truthfully, carefully drawn; and no writer ever lived who more fully despised the deceits of false art, its shams, and its hypocrisy than Le Duc, and he it is who announces that a building, to entitle it to rank among architectural work, must, first, be safely built, second, durable, and, lastly, beautiful—the relative importance existing in the order named.

Reader, were you ever a builder? and have you tried ever to interpret and execute some detail that the poetical architect has just "*sketched in*" for picturesque effect? If you have not, just try it; if you have, what did you say, and what did you do? An eminent writer in an English architectural journal recently said: "If knowledge of construction is thus essential to the architect on the utilitarian side of his art, it is not less necessary in an artistic sense. Not only is it important to know in what positions of a design certain materials may be safely used, but also what will be their appearance and effect. The former requirement applies to the scientific, the latter to the artistic element in architecture. Do you not see how carefully the line is drawn? Art and science are sworn enemies. Designs which may be effective in one material will be unfitted for others, but you know it will be very scientific to be acquainted with the nature of your material, its durability, the tests which it may have been submitted to by scientific men; but it will shock your artistic sense to know it, so if you are going to be an architect you must not know it. It is very vulgar to know anything about it. Faults of execution may interfere with well studied detail. Oh, yes; your detail must be masterly studied, must be skillfully colored, no striking contrasts, you know. But, if the execution is faulty, why—blow up the builder, or contractor, or what not. Color may be well or ill introduced, but it will violate the canons of propriety for you to study the physical laws of color harmony. That is scientific, but it is low art. Magnificence or meanness of effect may be produced by the dimensions or quality of the materials used, but you must never study the anatomy of proportion, that would be scientific. The end justifies not the means, but the means the end in architecture."

If the above were true, architecture would be destitute of principles, and how can the application of the knowledge of principles, which is the expression of art, exist without principles? Ah, but some writers will tell you art is above all principle, transcends all knowledge, and, therefore, it must be out of sight, invisible, intangible.

In truth, what shall a young man study who desires a fundamental knowledge of architecture? In the special course at Cornell University, the following subjects are mentioned: Building materials and construction, mechanics, designing, shades, shadows and perspective, free hand and linear drawing, decoration, photography, modeling, acoustics, Egyptian, Greek, Roman, Romanesque, Renaissance, Gothic, and modern architecture, and the books from which to study them are:

Ferguson's "History of Architecture," Viollet Le Duc's "Discourses on Architecture," "The Principles of Design in Architecture," by E. L. Garbett, Wightwick's "Hints to Young Architects," Lubke's "History of Architecture," Winckelmann's "Ancient Art," Reber's "Ancient and Mediæval Art," Stevenson's "House Planning," Street's "Brick Architecture of the Middle Ages," Gell's "Pompeiiana, Photographic Prints of Greek and Roman Remains," Grote's "History of Greece," Ihne's "History of Rome," Pugin's "Gothic Architecture," Parker's works on "Gothic Architecture" and "Domestic Architecture of the Middle Ages," Rivington's "Building Construction," Clark's "Building Superintendence," Barlow's "Strength of Materials," Stoney on "Strains," Shreve on "Roofs," Prof. Ricker on "Graphic Analysis of Roof Stresses," Wood on "Resistance of Materials," Goodeve or Twisdew on "Elementary Mechanics," Weisbach on "Higher Mechanics," Helmholtz on "Acoustics," Tyndall on "Sound," Miller on "Essentials of Perspective," Day on "Design," Japanese art decoration, Builders' Edition of SCIENTIFIC AMERICAN, *American Architect, Building, Carpentry and Building*, the *Sanitary Engineer*, *Decorator and Furnisher*, *Moniteur des Architectes*, *Materiaux et Documentes*, and latest works on electric lighting and house sanitation.

In the opinion of the writer, who, if he were a graduate of the Ecole des Beaux Arts, would be of the same opinion still, it is quite possible to become an architect without professional assistance, but he would advise a year of conscientious work and close application under the kindly directing guidance of a practicing architect, as the routine of office work will be of great value. The current architectural literature of the day is the most valuable and available avenue now open to theoretical and practical knowledge of architectural scientific art and artistic science. Its progress, enlightenment, and wise counsels have elicited the admiration of Europe, and should not be neglected at home.

A TWELVE HUNDRED DOLLAR HOME.

On a portion of our colored plate is shown a little house which has been specially designed with the view of providing a dwelling at the lowest possible cost consistent with sound construction. The architect has taken the minimum requirements to be a kitchen, a living room, and three bed rooms—one for the parents and one for the children of each sex—and has produced a design which, while possessing a pleasing appearance and a convenient arrangement, may be carried out at the low cost of rather less than twelve hundred dollars. This sum is that within which the house could be built in almost any locality, but in many places $1,000 would easily cover the expenditure.

The floor plans show the desirable arrangement adopted; the little hall, the small wash room, and the nice sized pantry, are conveniences which cost little, but add much to the comfort and completeness of the house, while the position of the stairs permits of the upper rooms being warmed to some extent from the kitchen heat below.

Full specifications and bill of cost will be found below, which, taken in connection with the accompanying sheet of elevations, plans, and detail drawings, will be amply sufficient to build from.

SPECIFICATION

of material to be provided and labor to be performed in building and completing a one and a half story and cellar frame dwelling house.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, and, taken in connection with this specification, to provide for the completion of the entire carpenter, mason, painting, tinning work, etc., as well as everything mentioned in this specification. Any work shown on the drawings and not mentioned in the specifications, or *vice versa*, is to be executed the same as if both mentioned in the specications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever.

Quality.—The whole of the work is to be executed in a good, thorough, and workmanlike manner. All the materials used to be of good quality, free from all defects impairing their strength or durability. The timber, except where otherwise specified, to be of good, well seasoned hemlock.

Sizes.—Plates and interties, 4″×4″; posts, 4″×6″; first and second floor beams, 2″ × 8″, all 16″ on centers. Rafters, 2″ × 6″; valley rafters, 2″×8″, 24″ on centers; all studding, 2″×4″, 16″ on centers; bridging, 2″×2″; ridges, 2″ x 8″; and ceiling beams, 2″ × 6″.

Framing.—All the studding to be placed 16″on centers; door and window studs, 2″ × 4″, doubled, including the heads; all partitions to be bridged horizontally once in their height with 2″ × 4″ bridging, well nailed at each end. Partitions coming over one another to rest upon the partitions below, and not upon the floor beams. All floor beams to be bridged with one tier of herring bone bridging in center, well nailed at each end. The entire frame to be mortised, tenoned, and pinned together with horizontal pieces 2″ × 4″, cut in on height on first story 3′ from centers, to nail vertical boards to. The trimmers, headers, and beams running under and parallel with partitions to be doubled beams, well spiked together. All floor beams to be laid with crowning edge up, and all studs to have hollow sides out. All sills to be halved at angles and corners, and the rafters to be neatly fitted to ridge and plate valleys, ceiling beams to be well spiked to side of rafters.

Flooring.—First and second floors to be laid with wide pine flooring, ⅞″ thick, well driven together and nailed to each and every beam.

Siding, Shingling, etc.—Do all necessary furring, and shingle the vertical sides, where shown, with XXX 18″ pine shingles; the bottom course to have rounded ends and to be laid not more than 5″ to the weather, on 1″×2″ laths, 5″ apart. Cover the lower portion of the building where shown with narrow tongued and grooved ⅞″ boards, driven perfectly tight together. No battens to be placed over joints.

Roof.—The valleys and gutters to be lined with the best I. C. charcoal tin, with all joints carefully soldered. Do all necessary flashing around chimneys, cheeks, etc. Shingle the entire roof with XXX 18″ pine shingles, laid on 1″×2″ lath, not more than 5½″ to the weather. Put up, where required, 3″ tin leaders, and connect with drains where directed.

Piazza.—The sills and bearing timbers for porches to be 3″×6″, floor beams 3″×6″, placed 20″ from centers, notched into the sill and well nailed; the floors to be ⅞″ thick, 4½″ wide, laid in paint, and blind nailed. Steps to have 1¼″ treads and ⅞ risers; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details; the piazza to be ceiled level on the under side with 4½″ beaded ceiling, ⅞ thick. The ceiling beams to be 2″×4″.

Blinds.—All windows except those in cellar to have 1¼″ outside blinds, made, hung, and fastened in the best manner and painted three coats at the factory.

Exterior.—The water table, corner boards, cornice, window frames, porches, and all other exterior ornamental work to be made of merchantable white pine, in accordance with the drawings; the ends of rafters overhanging the plate to be worked as per detail.

Window and Door Frames.—Window frames to be made for 1¼″ double hung sash, with 1¼″ pulley and hanging stiles; 2″ sills, and ⅞ subsills; 1¾″ axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside and hung at top with 3″ narrow butts and proper fastenings. Door frames to be made of 1¼″ plank, with rabbeted jambs; outside doors to have 1¼″ outside casings.

Sashes.—All sashes, except those in cellar, to be 1¼″ thick, of the dimensions and number of lights shown in drawings, and to be glazed with third quality French single thick glass; cellar sashes to be glazed with fourth quality glass. The double hung sashes to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts.

Doors.—The front door to be 1½″ thick, moulded as shown on drawings, and hung on 4″ cast loose butts, fastened with 4½″ brass face mortise lock, and fitted with porcelain furniture and drop escutcheons. Closet doors to be 1¼″ thick, paneled and moulded one side, hung on 3½ cast iron butts, and fastened with 4″ rim locks, with porcelain furniture for principal part of first story and mineral for second floor. Kitchen closet doors to be white porcelain reverse bevel rim locks. All doors, where needed, to have rubber tipped base pins and ash saddles.

Stairs.—Build the stairs as shown on the plans, from first to second stories with 1¼″ treads, ⅞″ risers, and 1¼″ strings, put up in the best manner, with the steps wedged with glue. Put in newel on second story with handrail, and plain balusters of ash, as shown on drawings. Cellar stairs to be rough spruce plank steps, housed into strings.

Trimmings.—The architraves for all doors and windows throughout the house to be 5″ wide, with bead on each edge. First and second stories to have turned corner blocks. The bases to be 6″ wide, moulded on top. All to be of well seasoned and clear white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on three sides as directed. Bed room closets to have one shelf with strips fitted with japanned hooks for coats and hats. Wash room to have strip with wardrobe hooks screwed thereto.

Grading.—The grading will be done by the owner.

Mantels.—Put up shelves around chimney and support same on brackets.

Privy.—Build privy 4′ 6″×4′ 6″×6′ 6″ high, of narrow beaded ceiling, and shingle roof; provide one small window to slide, and finish complete; put in batten door hung and latched complete; ceil the overhead part and floor the bottom; put in seats, two large and one small, these to have hinged covers, holes, and risers complete.

Back Panels.—All the windows to have neat moulded stools and aprons.

Painting.—Paint all the exterior woodwork usually painted, including privy, with two good coats of best "Atlantic" white lead and linseed oil paint; shellac all knots and sap before priming; and putty over all cracks, joints, nail holes, and nail heads after priming is done. Paint all tin-work with two coats of Prince's metallic paint, and the chimney with two coats.

All the colors are to be selected by the owner. The blinds will be painted at the factory. The whole of the interior work to be painted with two coats of such color as the owner may select. All the doors and saddles to be oiled, and the whole of painting to follow immediately after the carpenters.

MASON'S SPECIFICATION.

Excavations.—Excavate to a proper depth, as shown on plans, for the cellar proper, which is to be about 4′ 6″ below ground. Excavate for all foundations of piers, etc., 2′ 6″ deep, and stoop foundations, 2′ 6″ deep. All water that may accumulate during the excavation, from any cause whatever, to be removed at once, and the premises kept dry.

Brickwork.—Build up 8″ cellar walls, of good hard burnt brick (those generally used in the vicinity), to the full height of cellar, which will be seven feet in the clear, bricks to be laid in cement and lime mortar, mixed with sharp sand. Brickwork to have a course of headers in every seven, to be finished with struck joints inside and out. All angles and corners to be perfectly plumb and the walls level on top.

Brick Piers, etc.—Build brick piers where shown on plans, of good hard burnt brick, of dimensions indicated. All piers outside to be excavated for at least 2′ 6″ deep, and filled in with small stone and well hammered down to a solid bed.

Stoop Stones.—Put down stoop stones where shown, with foundations at least 2′ 6″ deep, filled in with small stones. On this lay flags, in two lengths, and 2′ wide, and of the full length of each stoop. Furnish and set bluestone sills to the cellar windows.

Chimney Flues, etc.—Build chimney flue as shown on plans, of good hard burnt brick, with joints struck smooth, and capped with bluestone cap, 3″ thick, with hole cut through.

Furnish and set a thimble where directed.

Vault.—Excavate and build privy vault where directed, 4′ deep, and projecting back 2′ in rear; this opening to be covered with a box neatly fitted.

Lath and Plastering.—The entire house to be lathed and plastered, except cellar, with one coat and hard finish; all done in the very best manner, and with the best materials. The mortar to lie at least one week before using.

Generally.—The mason will make all his work good after all other trades are done, and leave the building broom clean immediately after the plastering is finished.

Estimate and Bill of Materials.

MASON'S WORK.

No.		At	
56	yards excavating	$0 25	$14 00
8,000	bricks for foundations, laid	15 00	120 00
7	outside piers	2 50	17 50
1	chimney	..	17 00
4	bluestone sills	1 10	2 40
356	yards plastering, two coat work	30	106 80
	Cistern, finished complete	..	40 00
			$317 70

CARPENTER'S WORK.

2	2″×8″×24′	= 64 ft.		
2	2″×8″×14′	= 37 “		
1	4″×6″×18′	= 36 “		
1	4″×6″×14′	= 28 “		
1	4″×6″×16′	= 32 “		
38	2″×8″×14′	= 710 “		
6	4″×6″×15′	= 180 “		
6	2″×6″×20′	= 120 “		
8	2″×6″×23′	= 184 “		
8	2″×6″×26′	= 208 “		
6	4″×4″×14′	= 112 “		
4	4″×4″×12′	= 64 “		
1	4″×4″×18′	= 24 “		
1	4″×4″×24′	= 32 “		
6	2″×6″×16′	= 96 “		
275	2″×4″×12′	=2,200 “ = 4,127 feet hemlock timber.	$15 00	$61 91
850	ft. vertical siding		30 00	25 50
11,000	18″ pine shingles		4 50	49 50
300	1″×2″ shingle laths		4½	13 50
1	turned piazza column		..	2 25
10	ft. piazza rail		..	5 00
1	short column		..	1 25
4	piazza brackets		55	1 20
100	ft. water table		4	4 00
100	“ band course		5	5 00
8	small cornice brackets		50	4 00
160	ft. main cornice		20	32 00
100	“ of tinning		6½	6 50
30	“ “ 3″ leader		10	3 00
2	sets of steps, complete, ready to put up		..	6 00
10	ft. lattice under stoops		20	2 00
60	“ piazza ceiling		3	1 80
60	“ “ flooring		3	1 80
4	cellar windows, complete		..	6 00
7	first story windows, complete, with blinds		7 00	49 00
8	second ditto, ditto		7 00	56 00
1,000	ft. flooring		3 00	30 00
12	doors, complete, with trimmings		..	48 00
225	ft. surbase		3 00	6 75
	Main and cellar steps, complete, with ceiling and rail		..	26 00
	Shelving, kitchen pantry		..	3 50
	“ two closets on second story		..	3 00
3	shelves around chimney		..	6 00
	Pump and sink, complete		..	25 00
	Labor for all carpenter work		..	250 00
	Incidental items, jobbing, etc.		..	60 00
				$795 46

SUMMARY.

Mason's work	$317 70
Carpenter's work	795 46
Painting	60 00
Total	$1,173 16

A FIVE THOUSAND DOLLAR RESIDENCE.

This picturesque and attractive residence was designed for Mrs. W. B. Chapin, of Pomfret, Conn., by Howard Hoppin, architect, of 33 Westminster Street, Providence, R. I. The treatment of the elevation is most pleasing, the arrangement of the roof lines producing a very graceful effect, while the dwarf stone wall surrounding the piazza gives the whole design a very substantial and superior appearance.

The cost of the house is estimated at $5,000, made up as follows:

Mason.

Grading	$60 00
Excavation	70 00
Stonework	425 00
Brickwork and chimneys	225 00
Concrete, cementing, etc	100 00
Lathing and plastering	385 00
Outside plaster	45 00

Carpenter.

Heavy timber	400 00
Joists and flooring	370 00
Studding and boarding	275 00
Shingling sides	75 00
“ roof	175 00
Outside finish	250 00
“ mouldings	50 00
Sashes and frames	280 00
Doors, frames, and trimmings	325 00
Outside finish	250 00
Staircases complete	175 00
Mantelpieces	100 00
Tinning, gutters, conductors, etc	75 00
Plumbing	420 00
Painting, papering, etc	300 00
Incidental items	170 00
Total	$5,000 00

Mr. Hoppin, the architect of this house, has a very extensive practice in Rhode Island, Connecticut, and elsewhere.

Among the buildings for which he is responsible are the Union churches at Fruit Hill, R. I, and Buttonwood, R. I.; the Episcopal churches at Warwick Neck, R. I., Compton, R. I., Apponaug, R. I., Abington, Conn., and Riverside, R. I.; the residences of Bishop Clark, of Rhode Island, Mortimer Hartwell, Esq., Henry C. Bowen, Esq., and a large number of other extensive and important erections.

Specification.

MASON'S WORK.

Loam.—Take off, remove, and pile on lot where directed, all turf loam from under building and for 20 feet around same

Excavation.—Excavate, remove, and pile where directed on lot, all soil, gravel, clay, loose stones, etc., for cellar to house, as shown, and for trenches, piers, and foundations.

Trenches for walls to be dug 6″ below cellar bottom. On outside of cellar all trenches to be at least 3′ below grade.

Footings.—Bed on solid bottom, a footing course of good levelers under all walls, chimneys, piers, and foundations.

Cellar Walls.—Build cellar walls and foundations as shown, of good ledge and field stone, showing rough rubble on outside, all to be 18″ thick, and in half and half mortar up to sill. Rubble to be rough, with carefully bonded joints.

Wall Drain.—Dig a trench from outside foundation walls 6″ below cellar bottom, and fill with broken stones. Upon this put smaller stones, then hay, and fill up over with dirt. Level up all around house with pitch away from house. At southeast corner of drain dig trench from drain, with good pitch for 50 S.E., and fill in same in the same way.

Cementing Cellar Bottom.—Cover the whole of cellar bottom with a layer of cement, composed of two parts of sand to one cement. Lay even to a depth of 2″ thick. Also cover whole piazza floor with same, 3″ thick, and with good pitch, to outlet marked.

Cistern.—Excavate for and build a cistern 6′×8′×10′ deep, also a cesspool of same size and material. Both to be of stone laid in lime mortar, and thoroughly cemented both on bottom and sides. Build 8″ brick arch over top of each, with manhole, with iron rim and cover.

Overflow from Cistern.—One inch below inlet of water to cistern put in 3″ tile drain pipe, and dig trench and lay a line of 3″ tile pipe from same to grade with pitch from cistern to W. or S.W. of house. Protect outlet by heavy wire netting, with tile rim over end of pipe at grade, to keep out dirt, etc.

Caps to Stone Posts.—Furnish and put on with cement two terra cotta caps to front stone posts, and allow $25 for same.

Drains.—Lay a 4″ tile drain from 6″ above ground, where shown, to cesspool and connect same. Put in Y branch where shown, and lay a 2″ branch from same to waste from kitchen sink. At S.W. corner of house lay a line of 4″ tile pipes to join conductor to cistern. Both lines of pipe to be carefully and securely laid with close cemented joints. All joints to be wiped out as each pipe is set.

Chimneys.—Build chimneys as and where shown, of any good hard body brick acceptable to architect. The brickwork showing outside of house to be selected to even color and laid in red mortar.

Outside Plastering.—Provide and put on outside plastering, half lime, half Portland cement. Same to be carefully put on as directed by architect.

Fireplaces.—Build four fireplaces, as and where shown, of same brick, selected to even color and laid in red mortar with brick hearths. Flues to be 8″× 12″, parged up full length. Exterior of chimneys (inside of house) to be plastered up full length.

Thimbles.—Provide and set 6″ earthenware thimbles into flues extending from inside of flue to face of plaster, and no farther.

Lathing.—Lath both walls and ceilings of first, second, and third stories, also laundry and cellar, with good spruce laths, securely put on. Plaster the whole of the above with a good heavy coat of hair mortar, carefully put on and evened off. When this coat is dry, go over the whole with a good even coat of lime putty, leaving the whole even and clear.

Furnace.—Set a portable furnace (supplied by carpenter) in best manner on cement floor, no brick.

Whitewashing.—Whitewash whole of cellar walls and ceiling (except laundry), and leave same clean and white at end of job.

Lead Flashing.—Carefully flash with lead (supplied by carpenter) around all chimneys.

Stone Steps.—Furnish and set at front of piazza a flight of granite steps as shown. To be dressed off with hammer, squared, and set with slight pitch to front.

CARPENTER'S WORK.

The whole of the timber for framing to be of good, sound quality, free from shakes, sap, and other defects. Sills, 4″×6″; girders (two), 2″×8″, spiked together; posts, 4″ ×6″; plates, 4″ ×4″; studding, 2″ × 4″ and 2″ × 3″ (inside); floor joists, 2″ ×9″, set 16″ on centers; rafters, 2″ × 9″, 24″ on center; studding to be doubled at all openings, studs set 16″ on center.

Crossbridging.—Crossbridge both floors through length of building in two lines, in secure manner.

Cover.—Cover all roofs, sides of building, and floors with ⅞″ hemlock boarding, laid close and securely nailed.

Paper.—Before laying upper floors and before putting on outside finish, cover floors and outside boarding with a thickness of good heavy sheathing paper laid close, with edges overlapping.

Shingling.—Cover all roofs and sides of building as shown with good clear butts sawed cedar shingles, laid with lap of 4″ on roofs, 4½″ on sides.

Lead.—Furnish sufficient 4 lb. lead for mason to flash around chimneys.

Flashing.—Lay all valleys of roofs, also on all hips and ridges, with good tin, and extend on valleys 8″ on both sides. Carefully flash with tin on all joints of roofs, and of roofs and sides, and lay good strips over all exposed doors and windows, and leave the whole water tight. Shingles valley to be close.

Roofs.—To be looked over carefully at end of job. To be left clean and tight, and warranted so for one year from completion of work.

Gutters.—Provide and securely put on good tin gutters to roofs, as shown, with good pitch to outlets.

Conductors.—Provide and put on 3″ tin conductors. Pipes from connection with gutters to joint with tile pipes to cistern.

Furring.—All plastered ceilings to be furred, also over stone walls of laundry.

Upper Floor.—Lay a first quality upper floor ⅞″ thick. Matched Norway pine on whole of first story. To be blind nailed, and no boards wider than 5″. Other parts of house to have upper flooring of matched ⅞″ spruce of good quality. Laundry to have ⅞″ hard pine floor, on strips over cement, matched.

Thresholds.—To be of hard pine ⅞″ thick.

Frames.—All window and door frames to be of good quality white pine.

Sashes.—Make, glaze, fit, and hang all sashes for building of sizes and shapes as shown, of good white pine 1¼″ thick. Cellar windows to be hung at top, with button and hook, complete. Four sashes of west bed room to be hung at side with bolt and hook, as per details. All other windows to be sliding sashes, catch fastened.

Glass.—For whole of building to be of first quality, free from spot and stains.

Doors.—Doors of first story, front hall, vestibule, library, and dining room, and doors opening into same, to be moulded. All other doors chamfered. All to be stock size and finish. Vestibule and front doors to be gotten out to details. Front door, 1¾″ thick. Vestibule doors, 2¼″ thick. Back door and cellar door, 1¾″ thick. Other doors, 1¼″ thick.

Hardware.—Furnish and put on all butt locks, knobs, latches, bolts, handles, catches, etc., etc., to doors and windows of whole house. Locks to be strong and of good make. Allow the sum of $1.75 per door for trimmings, to be selected by architect.

Cutting and Jobbing.—Do all necessary cutting, jobbing, and boxing for plumbing, mason, and hot air pipes.

Inside Finish.—For whole house to be of Norway pine of first quality. Casings and bases to front hall, vestibule, library, and dining room to be moulded with simple member, as per details. All other finish to be perfectly plain. Casings, 4″ wide. Bases, 7″ wide.

Cellar.—Build coal partitions, where shown, of 1¼″ spruce plank, securely braced about 4′ high. Partitions of laundry on outside to be sheathed on cellar

side up to ceiling with ⅞″ spruce, also under stairs for closet.

Laundry.—Build table, as shown, of good white pine, 1¼″ thick.

Stationary Tubs.—Build and set up three wash tubs, where shown, of 1¼″ pine plank, with 10″ back, board over in best manner.

Finial.—Furnish and put on a finial, selected by architect, at a cost of $15.

Wire Netting for Outside Plastering.—Upon ⅞″ furring strips nail heavy ½″ mesh wire netting, as per details for outside plastering.

Closets.—To be fitted up as shown, all closets (except closet of kitchen) to have 12 double wardrobe hooks.

Tank.—Build and put up a tank in third story where shown, of 1¼″ pine plank, securely made, size 2′ × 3′ × 2′ deep.

Stairs.—Stairs from first and second stories as shown with rail and balusters between, all to be of hard pine, of following sizes: Posts, 5″ diameter turned. Rails, 2′ × 4″ stock. Balusters, turned out of 2¼″ stock. Risers, ⅞″; Treads, 1¼″. Make and set cellar and back stairs as shown, with plain rail and square balusters of hard pine. Treads and risers, ⅞″.

Steps.—Build outside steps as and where shown of hard pine.

Fresh Air Inlet.—Partition off cellar window as shown, and provide and put in same a galvanized iron fresh air box, about 18″ × 24″, with "damper" to furnace.

Furnace.—Supply and set a Chillson portable furnace, No. 8, where shown, with good sized japanned registers in position and floors as marked, and connect same with furnace as marked, care being taken to protect woodwork from hot air pipes or furnaces, where nearer than 2″ from same, by covering wood with bright tin.

Outside Finish.—All outside finish to be as per details, and to be of first quality white pine. Balusters of porch 2″ square. Floor of porch to pitch 1½″ to front. Under side of overhangs on south and west sides and overheads of porches to be sheathed with ⅞″ Norway pine.

Blinds.—Furnish and hang securely outside half swivel white pine blinds to all windows, except those in cellar.

Bell.—Furnish and put on a brass pull at hall front door, with all necessary wire, cranks, etc., to bell in kitchen, and to leave all in good working order. Pull to match trimmings of front door.

Mantel Pieces.—Make and put up mantel pieces in front hall, library, and dining room, and put up shelf over fireplace in second story bed room as shown. All to be gotten out as per details and to cost $100 finished.

Glass Partition.—Make, glaze, and fit a glass partition to back porch, with door as shown.

Bath Tub, Bowl and W. C.—Seat and riser of W. C. to be hung. Bowl to have cupboard and door. Sheath around bath room with ⅞″ Norway pine up to line of rail on level with top of marble backing over bowl. All wood for same to be of Norway pine.

PAINTER'S WORK.

Outside.—Give all shingles (except roofs) outside one coat of Cabot's creosote stain of number selected by architect (probably No. 321). Give all trimmings, wood finish, blinds, gutters, conductors, etc., outside two coats of first quality paint, in such color as the architect may direct. Under side of porch roofs and overhangs to have coat of boiled linseed oil, with yellow stain in it. Hard pine outside to have good coat of raw linseed oil.

Inside.—Give all sashes inside, and iron and lead pipes, etc., inside, two coats of first quality paint, of such color as the architect may direct. All other woodwork to have two coats of shellac.

Front Stairs.—To have coat of good filler, and three coats of shellac, all rubbed down with pumice and oil to dead finish.

Wall Paper.—Furnish and hang wall paper with borders, etc., as selected, on walls and ceilings, as directed. Allow the sum of 75 cents a roll put on for said papers and borders. The walls and ceilings of vestibule, front hall, coat closet, library, dining room, second story halls, dressing room, three bed rooms of second story, tower bed room of third story, and closets opening out of same, to be papered.

Give the walls and ceilings of kitchen, pantry, china closet, back entry, first story, bath room and closets opening out of all, two good coats of first quality paint, in colors selected by architect.

PLUMBER'S WORK.

Supply.—Run tin lined lead pipe, ¾″ inside, from cistern to a double branch cock under kitchen sink and through same to pump at sink; from pump run a ¾″ lead pipe straight to tank in second story and over top of same.

Pump.—Supply and put in a first quality force pump, of make selected by owner, and connect same with supplies as specified.

Tanks, etc.—Line tank with 4 lb. lead, in the best manner; cap other arm of branch cock under pump, and to join to second line of supply from a well if that is put in. (Supply from well to be put in by owner.)

Waste.—Provide and put in a 4″ line of iron soil pipe from connection with the tile drain outside of wall under cellar floor, with quarter bend to Y branch, and from same straight up to water closet, with branch for same, and from thence straight up to and through roof and for one foot above, and securely connected and flashed at roof; provide and put in a 2″ iron waste pipe from connection with the tile drain outside of wall under cellar to kitchen sink; to have Y at kitchen sink, and pipe to run to and through roof, for vent, flashed and made tight like main 4″ vent.

Supply from Tank.—Run a ¾″ lead supply pipe from tank to bath room, thence to supply service tank to W. C. by ¾″ pipe and floating ball cock. Supply tub by ¾″ branch and bowl by ½″ branch from same. From bath room run to kitchen sink a ¾″ pipe with ¾″ branch to tubs in laundry, and with ¾″ supply to boiler in kitchen. Tank to have ½″ tell tale to kitchen sink.

Boiler.—Provide and put in a first quality copper boiler of 30 gallon capacity, supplied from tank as specified, and connected by ¾″ brass pipe in best manner, with water back in stove. Boiler to supply kitchen sink, laundry tubs, and tub and bowl in bath room, and from highest point of same to return to and over tank in third story for exhaust.

Bath Tub.—Provide and set a first quality tin lined copper bath tub in bath room, supplied by ¾″ cold and hot water, and with 1¼″ lead waste by S trap directly to main waste.

Water Closet.—Provide and put in a first quality "National" water closet, supplied from service tank by chain pull through 1¼″ lead pipe, and with waste by 4″ lead trap to main 4″ iron soil pipe.

Bowl.—Provide and set a good porcelain wash bowl where shown, with hot and cold supply as specified, and with 1¼″ lead waste by S trap to under side of trap of bath tub. Bowl to have marble slab and back pieces on each side, 8″ high. No countersinking.

Kitchen Sink.—Provide and set in kitchen where shown an iron sink about 2′×4′ with hot supply as specified, and with cold supply through double cock by pump, with 1¼″ waste to 2″ iron waste by S trap.

Laundry Tubs.—Connect with laundry tubs in best manner, with hot and cold supplies as specified, and with 2″ lead waste by S trap main, 4″ waste from bath room.

Joints.—All joints of iron pipe to be carefully calked with lead. All joints of lead pipe to be wiped.

Trimmings.—All trimmings and screws of bath room to be brass nickel plated. All other trimmings to be brass.

Back Air.—From upper bend of trap at laundry tubs to run a line of 2″ iron bent pipe, straight up and to connect by easy bend to main, 4″ waste above all fixtures. Connect same with upper bend of W. C. trap, and with trap of bath tub, in best manner for back airing.

DESIGN FOR A STORE AND STABLE ADJOINING.

A CARRIAGE HOUSE AND STABLE OF MODERATE COST.

A COTTAGE ON RIVERSIDE PARK, NEW YORK.

The Riverside Park, New York City, occupies a narrow strip of land on the edge of the Hudson River, extending from 72d Street to 124th Street. The river views are magnificent in all directions. The city building lines extend to the edge of the Park, and buildings fronting thereon may be said to stand within the Park itself. Probably there is not in any city of the world a more sightly place for private residences than Riverside Park. The Park is not yet wholly finished, and but few dwellings have been erected. One of the few is the residence of Mr. George Noakes, a sketch of which we give. It is admirably located at 113th Street, fronting the Park, which it overlooks, and from its windows and balconies the prospect is grand. The broad bosom of the Hudson River appears in view in all directions, giving the impression of a great lake.

The house is built of granite, and was designed by A. B. Jennings, architect, New York.

STORE AND STABLE.

This design for a store, with a stable adjoining, is rather pleasing. It is from a recent issue of the *Sanitary Engineer.*

CARRIAGE HOUSE AND STABLE.

A friend in New Hampshire sends us this sketch of the building, which stands near a little grove in a picturesque location. The walls are double boarded and battened. In place of clapboards, pieces of birch and pine are nailed to the outside, as shown in the picture. The pieces were cut 18 inches long, and split. This covering gives a neat and rustic appearance.—*Rural New-Yorker.*

The Silver Birch.

I have often felt surprised that this tree should not be more extensively planted in pleasure grounds, parks, and on large estates generally than it is. In manner of growth it is so graceful, so distinct from all other forest or hardy trees, as to render it eminently fitted for purposes of isolation. A large well-developed tree, so placed that its natural habit is fully displayed, forms a very pleasing feature in the garden landscape, not only when in full leaf, but also during the winter months, when, denuded of foliage, its characteristic features are more fully revealed. The graceful, spray-like, pendulous growth and silvery bark show up charmingly against the fresh bright turf of a well kept lawn, a tree dotted here and there about pleasure grounds doing much toward relieving them of their sameness, and, where evergreens are largely employed, the rather somber aspect during the dull months of the year. There are, however, a variety of ways in which the silver birch might be employed. It has a very pretty appearance when so placed among coniferous trees and evergreen shrubs that they form a background to it, in such a manner that the head of the birch stands out clear and well defined, while the white stem is, as it were, framed in verdure. In parks, good use might be made of this tree by grouping it here and there in such a manner that the bright stems would be distinctly visible when the foliage was off. I may mention, however, that there is considerable variety among the silver birches, some having the bark much more silvery than others, and having consequently, from an ornamental point of view, a much higher value. It is a pity that seeds should be saved from inferior varieties.—*J. C., the Garden.*

DWELLINGS AT EVANSTON, ILL.

In the *Building Budget* for April we find a very pleasing group of semi-detached dwellings, which we here reproduce. They are of moderate cost, but substantial in structure and appearance. It is pleasing to note how rapidly the erection of handsome dwellings is progressing in Evanston and neighboring places.

SEMI-DETACHED DWELLINGS, EVANSTON, ILL.—A. M. F. COLTON, ARCHITECT.

The Architect and House Drainage.*

It is very evident that the most important part of an architect's labor is that which concerns his client's health and comfort; therefore, the architect ought to be familiar with all the details of his work; for on him rests the responsibility for the healthfulness, comfort, and cost of the work over which he has charge, and in a degree for the general standing or rank of the art of plumbing throughout the country.

In planning for a house, some of the first and most important details to be considered are its location, character of the subsoil, construction of foundation, and means for preventing dampness of walls, properly lighted cellars, ventilation, drainage, water supply, arrangement of plumbing fixtures, the instant removal and proper disposal of water after it has performed its duty, being then fouled and mixed with excrement, greasy matter from the kitchen and pantry sinks, after its use in the bath tubs, wash basins, etc.

Our time will not permit taking up all these in detail, as they should be, in the few evenings you have set aside for this subject, but I hope in a general way to cover as much ground as possible, offering a few suggestions as to the mechanical execution, construction, latest sanitary ideas, and most improved fixtures inside of a building. For this purpose, let us suppose that the site has been selected and the building so far advanced as to receive, probably, the first thing to be located and constructed—the drain with its trap and fresh air inlet. This should be four inches in diameter, of extra heavy tar-coated, cast iron pipe, very rarely more than five inches, with a fall of at least one-fourth of an inch to the foot, either suspended from cellar ceiling or along the foundation wall, unless there are fixtures in the cellar. In this case, it is not advisable to bury it all below the floor.

Iron soil or drain pipes should not be made too light, for a number of reasons. They do not possess the required strength. It is impossible to cast them with any degree of evenness in thickness; one side may be one-sixteenth of an inch thick, while the other would possess its own thickness with that which is wanting or taken from the other side. When cast so thin, they are as hard as chilled iron, and about as brittle and difficult to cut as glass; a slight blow with a hammer or knock would crack and splinter them in atoms. They are more likely to have sand holes and, on the whole, are utterly untrustworthy at all times. The additional cost of extra heavy iron is only for the iron—the labor remains the same.

The trap should be located just inside the cellar wall, or outside the house in a man hole with a fourth inch fresh air inlet branching from it as close to the inside of the trap as possible, to secure a free circulation of air throughout its entire length, and carried outside the house two feet above the surface of the ground, away from windows.

It is a common practice here in Philadelphia, as well as in New York and some other cities, to locate the fresh air inlet at the edge of the pavement or at the face of the curb, and covered with a perforated plate. They are sometimes closed for days in bad weather by snow and ice, and I have not the least doubt that some of them are closed, or nearly so, the year round by mud and rubbish. When this occurs, their usefulness and security cease. The proper place is certainly above the surface of the ground, and not too near windows or doors.

All branches entering this drain should be made with Y-fittings, and never with T's. All vertical lines of soil and waste pipes should be turned at their base to a horizontal one with long $\frac{1}{4}$ or $\frac{1}{6}$ bends of a large radius and running in the most direct and straight line to and through the roof, full size, above the highest point, remote from the windows, ventilators, and chimneys. If alongside the chimneys, keep the soil pipe well below the top, on account of a down draught, which has been known to occur quite often in practice, especially in the unused flues for open fireplaces. The tops of these pipes ought to be left perfectly free and open without cowl or ventilator, which not only aggravates the circulation of air, but affords a good place for the accumulation of hoar frost, by the warm air from the drain in severe cold weather. I know of an instance where the cowl was so incased with ice as almost to make it air tight, and the result was the siphoning of a number of traps. Col. Waring says that all vent pipes, of whatever size, ought to be increased two sizes as they pass through the roof, and, by experimenting, it was found that a universally effective increase of the movement of air is secured by increasing the diameter of the pipe at its upper end.

It is also a well known fact that every deviation from the straight line obstructs the current by increasing the friction. Therefore, the cap, or bend, or cowl, one or another of which is almost always used, is of no real utility in a high wind, and is an absolute obstructor during light winds or calms. The best results will always be obtained by running the soil pipe straight up to a certain elevation above the roof, more or less according to the exposure, and leaving it entirely open at the top; or, to prevent accidental or intentional obstructions, where it is likely to occur, the ordinary spherical wire basket should be inserted into the mouth of the pipe and securely fastened.

The horizontal drain in the cellar should be suspended from the ceiling by strong wrought iron double hangers, dogged to the timbers at least every ten feet; or, if along foundation walls, supported by brick piers or strong wrought iron rests driven well into the wall between the joints.

The vertical line of soil and waste pipes ought to be supported at their base by brick piers or stone posts, to carry their weight, and not depend on the frail clamps which are very commonly used by some plumbers. The settlement of soil pipes has very often caused serious trouble (in good work every other way), by the neglect of the workman giving it the proper support at its base during its construction. In jointing cast iron pipe, the spigot end of one pipe must enter as straight as possible into the hub end of the next, to secure a perfect joint. In any change of direction in a line of pipe, the proper bends must be used, of which there are enough varieties in the market to form almost any angle.

On one of my inspections not long ago, I found a joint so calked as almost to close one side of it, which, of course, must be imperfect, for though the lead did completely fill the joint, it was impossible to calk it tight at the contracted part. In making these joints, a gasket of oakum or hemp should be well rammed in first to about one-third its depth, to prevent the molten lead from running inside the pipe—the rest of the space filled with soft pure lead and thoroughly calked, or about one pound of lead to every inch diameter of pipe. In a residence in Boston a few years ago, in applying the water test, I found that almost every joint leaked more or less throughout the whole system, owing to the fact that the plumber, either by mistake or economy, used old lead mixed with tin, zinc, or some other hard metal in making the joints, which, of course was so hard as to prevent his calking it with any degree of safety without bursting the hubs. These joints can and should be made tight without the use of putty or paint. I would suggest that they never be treated with cements of any kind, but left exposed, showing the marks of the calking tool in the lead, and after the lead wastes are calked into their respective branches, subject the whole system to a water or peppermint test, and inspected by the superintendent or engineer. In passing through the foundation wall, the opening should be enough larger than the outside diameter of the pipe to allow the walls to settle without crushing or deflecting the pipe.

In my estimation, based upon experience and careful examination of good work, the best sizes and weights of lead waste pipes for the different fixtures are as follows:

For sinks—kitchen, scullery, and pantry—1½ inch, 3 pounds per foot.
Bath tubs, 1½ inch, 3 pounds per foot.
Wash basins, 1¼ inch, 2½ pounds per foot.
Row of basins, 1½ inch, 3 pounds per foot.
Urinals, 1½ inch, 3 pounds per foot.

All waste pipes should have a sufficient fall to insure the running off of all water and leaving them stand empty. Avoid long horizontal runs by placing fixtures as near as possible to the vertical lines, and keep them open and above ground or floor. No pipes should be concealed behind anything but a hinged casing, or, if under the floor, provided with a continuous support on boards with proper grade, and the boards covering them screwed down for examination or repairs.

All jointing of lead wastes should be made by wiped joints and connected to the iron with a brass ferrule or sleeve, soldered to the lead pipe and then thoroughly calked into the iron pipe with molten lead.

There are some fixture and waste pipes that to connect them with the drain would be very apt to cause serious results. For instance, the refrigerators ought never to be connected directly with any drain or sewer, but may waste into a pail or zinc pan movable by hand, or into an open sink, or the open air. Large sizes, say for hotels, where it is impossible to do otherwise than waste into a drain, they should first waste into an open pan or cup below the water line, and that be connected to the drain by a deep sealed trap. A stop cock may be placed in this pipe, so that when not in use it can be cut off from the drain, independent of trap.

Overflows from tanks, drip pipes from safes and floor linings, sediment, or waste pipes from boilers, must never be connected under any circumstances with the drain. The former can be discharged into the gutter of the roof, an open sink, or the open air. This case only applies to storage tanks for drinking and cooking purposes.

Water closet tanks are provided in themselves to overflow into their bowls. Drip pipes, or, in other words, tell-tales, which they are, should terminate just below the ceiling of the basement or cellar, either with end left open, or, perhaps, a better way is to turn the end up, forming a trap, and then caging a rubber ball on top. This is merely to cut off the circulation of air from the cellar, or the odors from cooking in the kitchen rising through this pipe into the rooms above.

Boiler wastes, or the sediment pipe, can discharge into an open sink if convenient, or in place of this, and a simpler way, is to insert a common hose bib or faucet into the cold water or lower pipe leading from the boiler to the range.

FINAL RULES.

All fixtures should be located as near as possible to the soil pipes, both for economy and safety. On the score of economy, the saving should be in quantity, and not in quality. Concentrate all plumbing on each floor as near to the vertical line of soil pipe as possible, and make one stack of pipe answer. Secure the utmost simplicity consistent with needed convenience. One soil pipe with one bath and two closets, all of the very best, will answer the necessary uses of a large family, and will be safe. Two stacks with half a dozen closets and baths, if as good, will cost vastly more and will be less safe.

On the score of safety, one stack will be more regularly used and flushed than two, consequently cleaner.

Secure an absence of dribbling streams, and use fixtures that produce the most copious flushing when used; the freest possible circulation of air in all parts of the system, except so near traps as to evaporate their seals; the absence of all avoidable casing, and above all get all the wastes completely out of the house before they begin to decompose. Let the water closet be as smooth and plain and fair as a new egg, and the waste pipes stand empty when not in use.

* Address by Geo. F. Brown, sanitary engineer, before the Philadelphia Chapter of Junior Architects.

A CORRESPONDENT of the *Country Gentleman* tells of butter pressed in a mould so as to look exactly like a large fine strawberry. One of these berries was put by the side of each plate, and an extra supply stood in the center of the table on a fruit dish. Gilt edged butter, in such fancy shape, should sell for high prices.

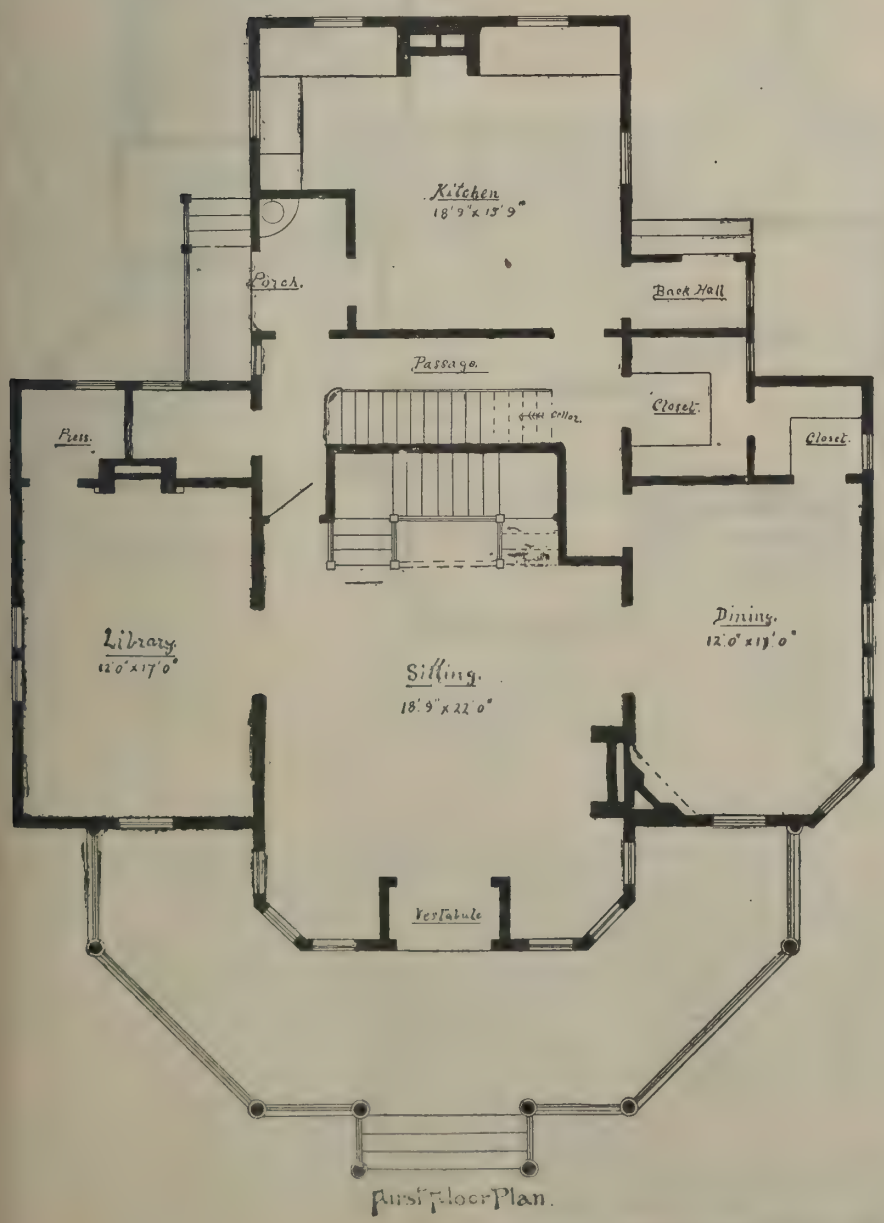
A DWELLING FOR THREE THOUSAND DOLLARS.

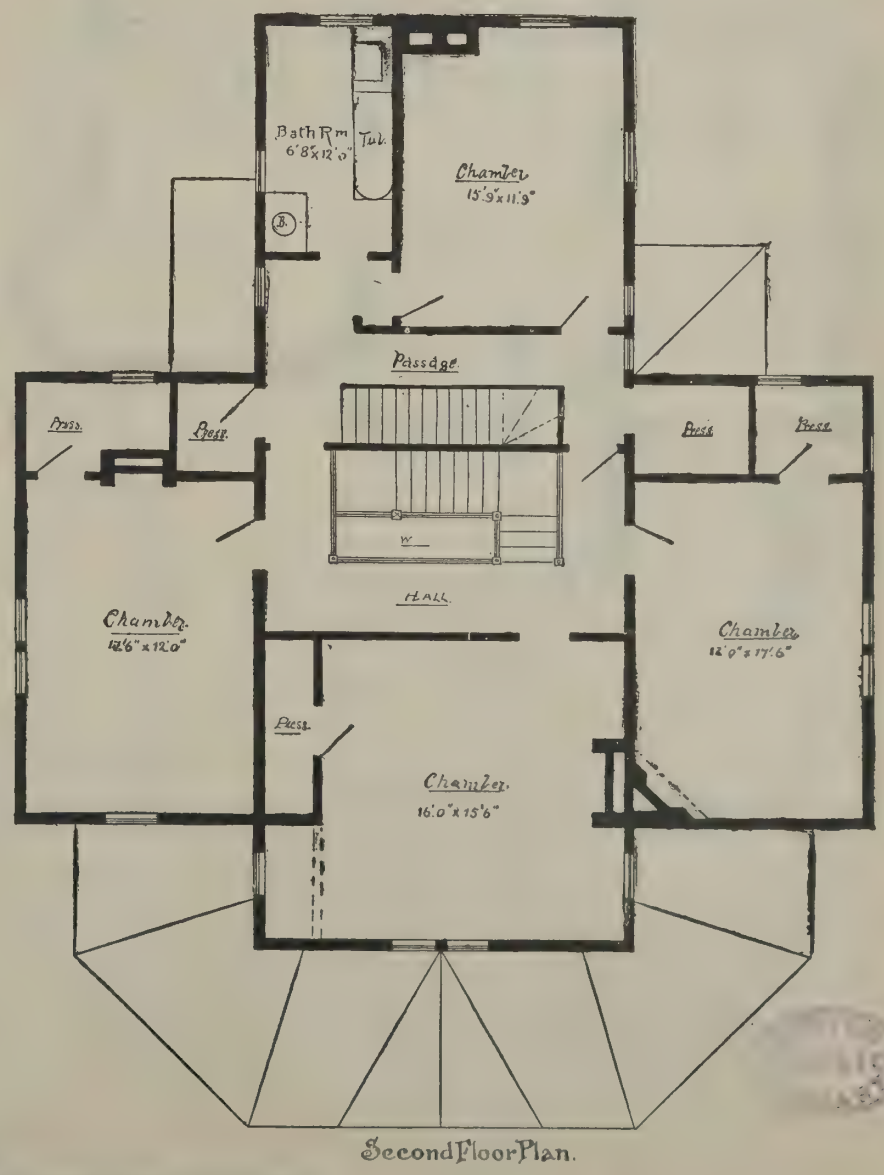
This attractive little residence was erected a short time since at Portsmouth, R. I., from the designs of George W. Cady, architect, of 164 Westminster Street, Providence, R. I., at a cost of rather less than $3,000. The rooms, as shown by the plans, are spacious and conveniently arranged, and there is a cellar 7′ 6″ deep under the whole building.

The foundation walls are of "Danvas" brick, laid in black mortar, and the chimneys and piers are carried up in the same way. The main roof is shingled with first quality Eastern shaved shingles. The corner boards are 6⅞″, base ⅞″, band ⅞″, and boarding below band ⅞″. The sizes of the main timbers are as follows: Sills and posts, 4″×6″; cross beams, 6″×8″; joists, 2″×8″; rafters, 2″×4″ and 2″×8″; main rafters, 7″×2″; hip and valley rafters, 2″×8″, and ridge, 1″×8″.

The front staircase is executed in hard wood, and has a tread 1⅛″ thick, risers ⅞″, strings 1⅛″, rail 2″×4″, and posts 4″×4″. The back staircase is of hard Southern pine. The dining room and library are finished in pine, and the sitting room in ash, with 5″ bases, 7⅛″ trim, and 2″ moulding.

The water closet apparatus is the "Bartholomew," and the sinks the "Miller" variety. The exterior of the house is painted with Johns asbestos prepared paint, of the following tints: sides and gables, red; main building, light drab; weather boarding, dark drab.





A DWELLING FOR THREE THOUSAND DOLLARS.

A RESIDENCE AT ORANGE, NEW JERSEY.

In a recent number of the *Builder and Wood-Worker* we find an elevation and plans for a comfortable looking house, which we herewith present. Messrs. Stuckert & Dietrich, of this city, are the architects. The house has a frontage of 48 feet. The principal dimensions are: Parlor, 14×19½ feet; dining room, 15×17; kitchen, 11×16; middle bed room, 15×15; left front bed room, 15½×18; right front bed room, 15×21; back bed room, 12×17.

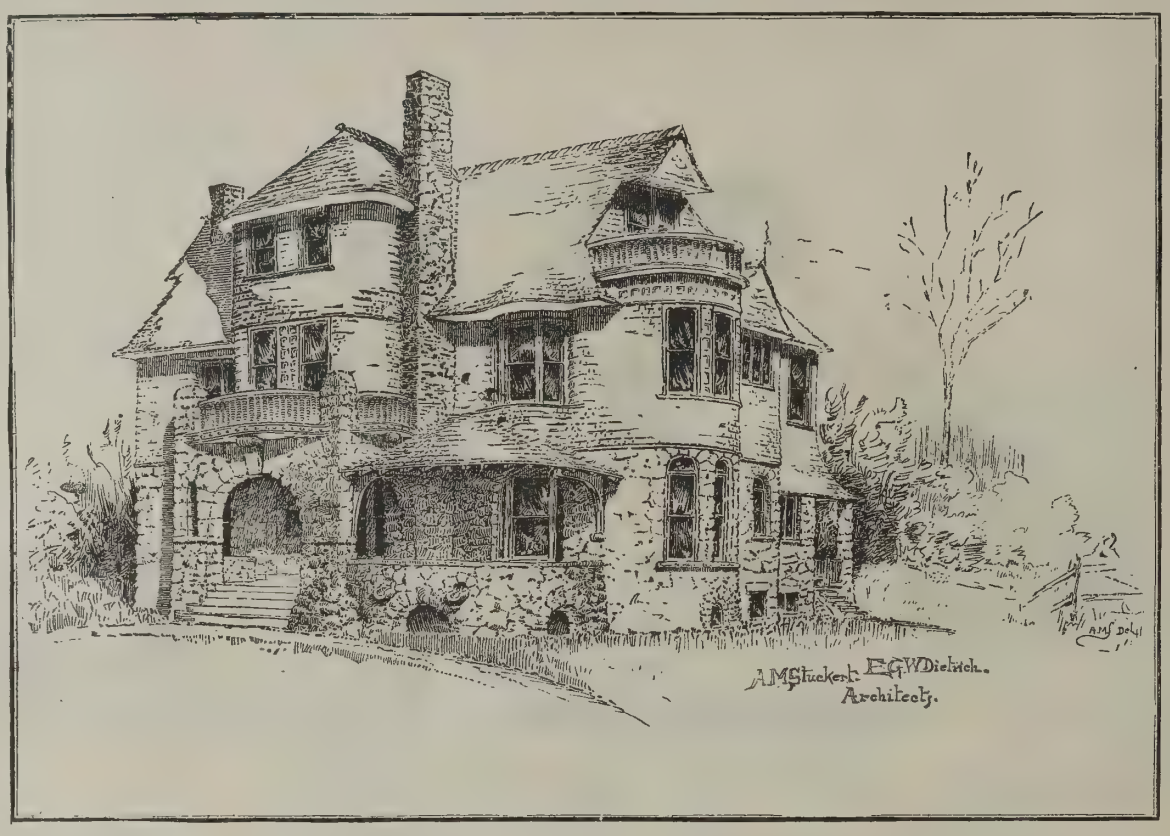
Failure of the New York Plumbers' Strike.

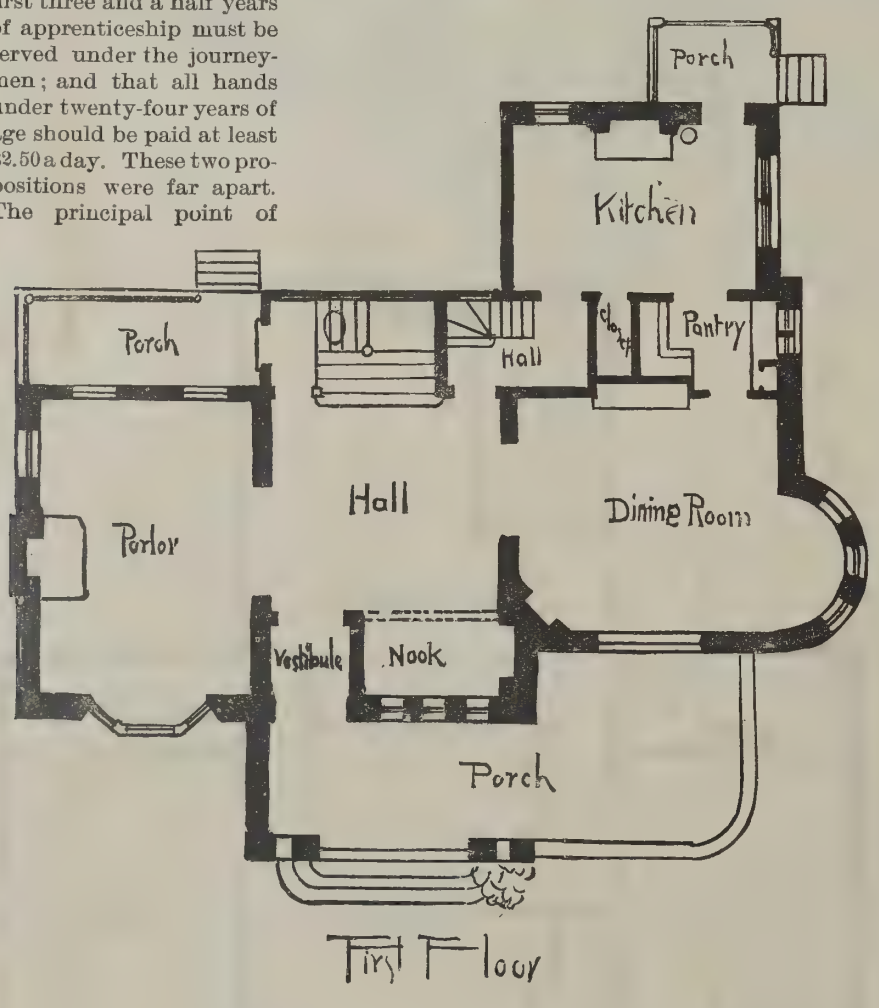
The long strike of the journeymen plumbers of New York city has at last been declared off. The strike began September 1, 1886, and has been on since that time until recently, when the contest, which for some time had been entirely one sided, was declared at an end. The cause of this strike was the decision of the master plumbers' association that apprentices must be at least 16 years of age; must read and write English; must understand the four cardinal rules of arithmetic; must serve five years; and must be under the sole control of the masters. The last provision was the one to which the journeymen most objected, but they refused to tolerate the masters' requirements. The journeymen then addressed a pronunciamento to the masters, in which they declared that a master should take but one apprentice for every four journeymen; that the selection of apprentices must be subject to the journeymen's association; that the first three and a half years of apprenticeship must be served under the journeymen; and that all hands under twenty-four years of age should be paid at least $2.50 a day. These two propositions were far apart. The principal point of difference was, however, the control of the apprentices. All the other questions might have been arbitrated, but on this important feature neither side would yield. The masters went into the fight determined not to yield their position, which was undeniably the right one. The masters have all through these dreary seven months been nobly carrying on the "battle for the boys," and have been growing stronger every day, both in material resources and in influence in the city. The masters have secured the sympathy of all other trades in this fight, and respect for their principles. Their association has been closer knit together than it was before, and, in the end, we believe the benefits derived by the masters will more than balance the losses they sustained in the earlier part of the strike. The last portion of the strike has inconvenienced them but little. All members have had all the men they needed, and have attended to their business promptly, with but one or two exceptions. They have made gains in membership; they have established a healthy influence for other employers to follow; they have indorsed the trade school system, and have made its instruction a part of the apprentices' term of indenture. These are direct gains. The journeymen have experienced nothing but defeat ever since the beginning of the strike. They started in with the experience of previous strikes to guide them and with the promise of adequate financial support from the national association of journeymen plumbers. They made boasts about the co-operative plan of carrying on business which they were successfully to establish, but which they did not. They have drawn on their working comrades for $100,000, which has supported them in idleness. They have succeeded in driving off their most conservative and best members into the formation of an independent journeymen's association. They have disrupted their original friendly relations with the gas-fitters, and made them enemies They have sustained defeat on every point, and have now lost the fight entirely. Could anything be more humiliating?—*Sanitary News.*

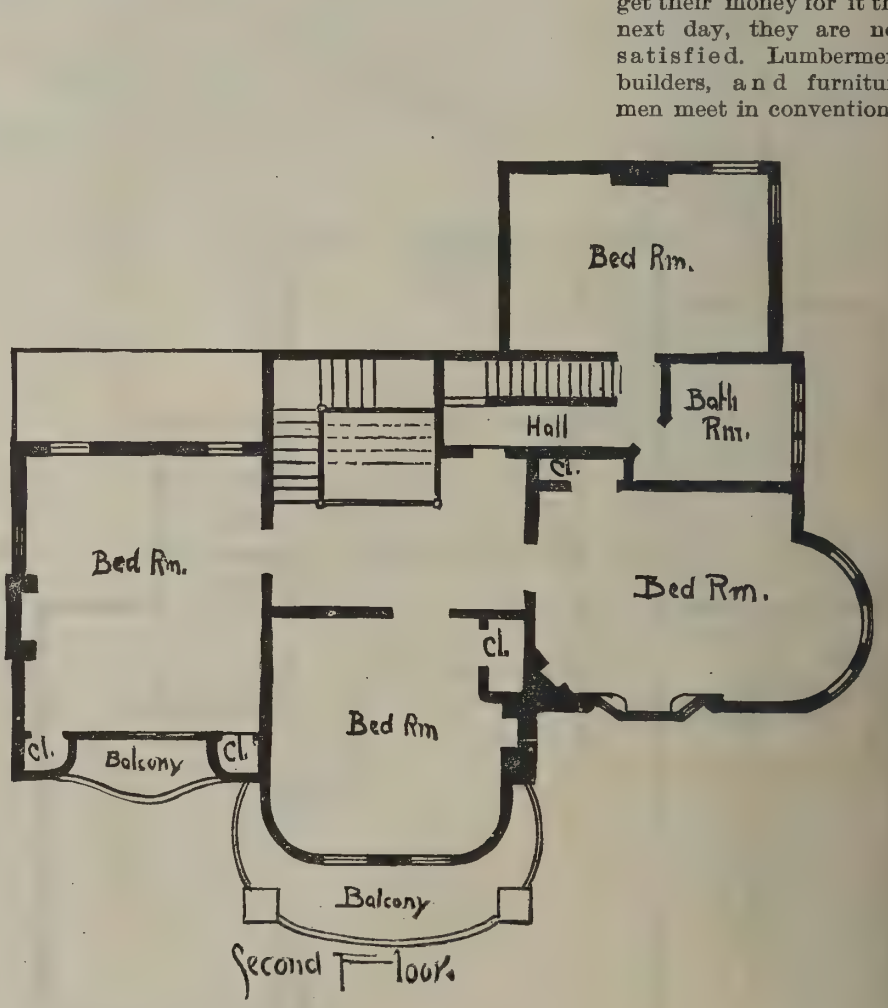
A GREAT marble deposit has been found in Inyo county, Cal. The marble is of superior quality, hard, solid, and free from flint. A test resulted in crushing an inch cube of the Inyo marble at 26,900 pounds.

Seasoned Lumber.

Lumber drying, as a rule, is slovenly and imperfectly done. It is the most neglected branch of the entire lumber business and its attendant industries. It is rare that inside finish, thoroughly seasoned, is seen. After a little the windows become so loose that they rattle, and the panels of the doors shrink to such an extent as to show unpainted streaks. In fine and expensive hardwood work more pains is taken. When it comes to furniture, not one manufacturer in a hundred knows his business so far as seasoning lumber is concerned. They are as blind as bats to one of the most important elements of their business. Taking their output as a standard, it is doubtful if they know seasoned from unseasoned lumber. Provided they know one from the other, it is plain they don't care which they use. All this shoddy work by carpenters, contractors, and furniture makers might be avoided. It is simply the result of haste, probably due in some cases to ignorance, in others to a lack of ample working capital, in others to a desire to make capital as remunerative as possible, and still in others to a don't care spirit. That lumber can be properly seasoned it would be foolish to question. In the absence of dry kilns it will so season if a roof be placed over it and it be exposed to the air long enough. Time is required by this natural process, however, and that's where the rub is. House builders and furniture manufacturers want to save time. If they cannot buy lumber to-day, work it up to-morrow, and get their money for it the next day, they are not satisfied. Lumbermen, builders, and furniture men meet in conventions, and talk about nearly every other subject under the sun that pertains to their interests except drying lumber. Never to our knowledge has this subject been up for discussion in one of these conventions. And so long as house and furniture buyers stand ready to pay them money for what they may safely bet ten to one is an imperfect article, the subject probably never will come up.—*N. W. Lumberman.*







A RESIDENCE AT ORANGE, N. J.

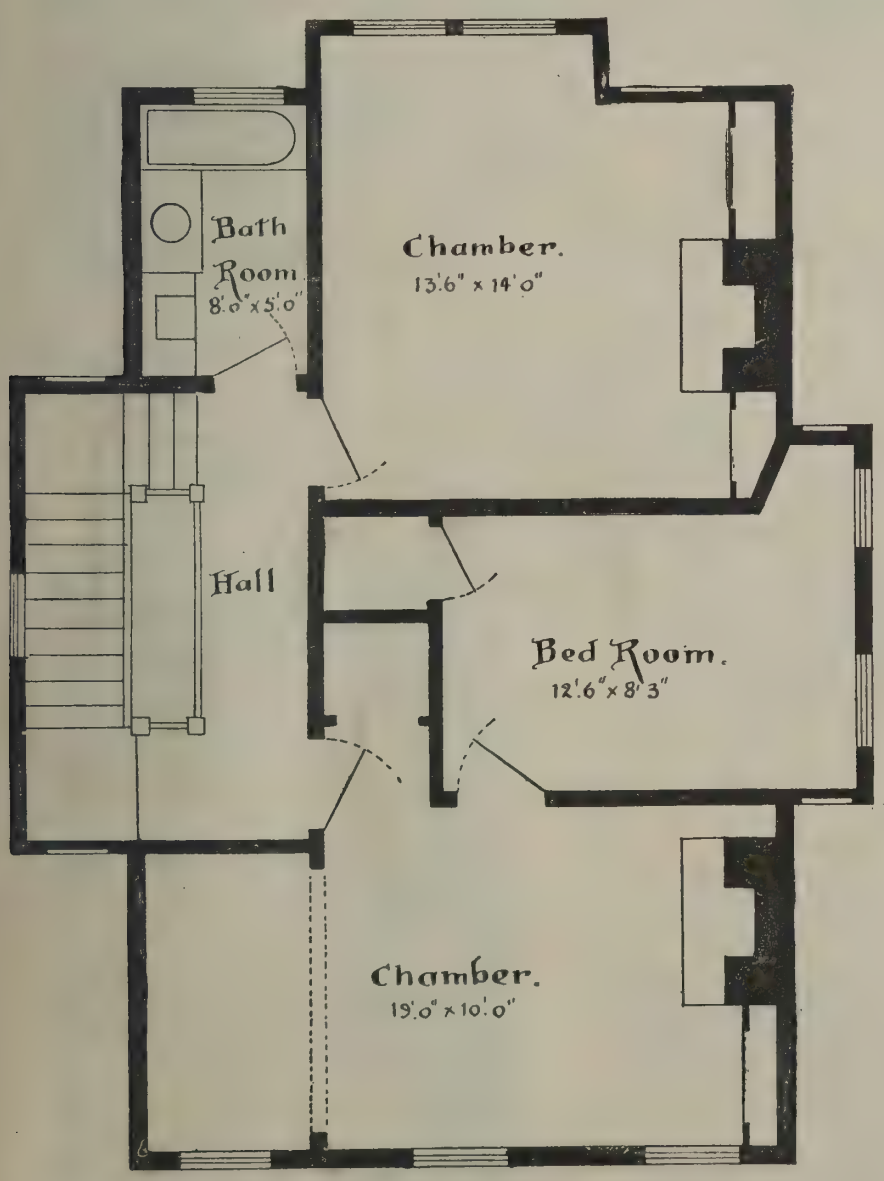
WE should be pleased to have our readers bear in mind the fact that full plans and specifications for any of the buildings illustrated in this paper may be obtained at this office on moderate terms. We are assisted by able architects, and can execute any work desired on very moderate terms. Munn & Co., 361 Broadway, New York.

A THREE THOUSAND DOLLAR HOUSE.

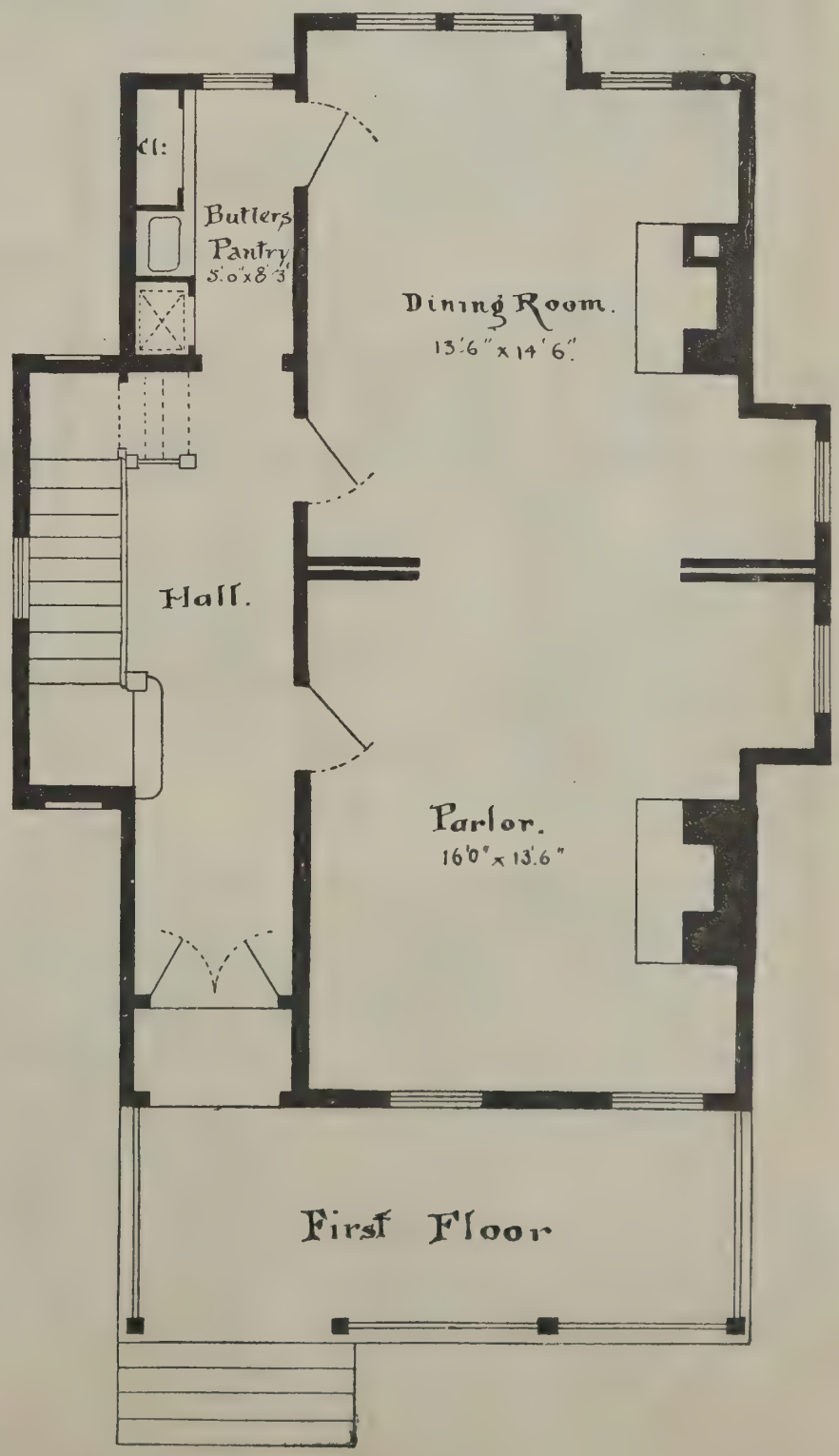
This attractive and conveniently arranged little residence was lately erected on Fleetwood Avenue, near Popham Street, Mount Hope, New York, for Mr. A. MacIntosh, Jr., from the designs of Architect John E. Kerby, of 280 Broadway, New York city. In the basement is a kitchen measuring 14′×16′, fitted with wash tubs, sink, and range, besides coal and other cellars and furnace room. In the attic are three good-sized bed rooms and large hall.

The foundation of the house is stone; the frame is clapboarded up to level of top of first floor and shingled above, and the chimneys are carried up in brick. The interior trim is natural cherry wood on the first floor and pine on the others. Gas, heat, and all other necessary improvements have been provided.

The house cost the sum of $3,500 to build, but with a little plainer material it could be easily erected for $3,000.



Second Floor.



First Floor

A THREE THOUSAND DOLLAR HOUSE.

A Building Union in Chicago.

At a recent conference of delegates from every building interest in Chicago, with representatives present from the Illinois Architects' Association, the Chicago Real Estate Board, and kindred bodies, the members of which hire altogether probably 50,000 workmen, a resolution was unanimously adopted that from this time forth the signature by the employe to the following card of principles be made a universal condition of employment by all the building interests of Chicago:

"I recognize the right of every man to decide for himself without dictation or interference when he shall work or cease to work, where he shall work, for whom he shall work, how many hours he shall work, and for what wages he shall work.

"I recognize the absolute right of the employer to decide for himself, without interference from any source, whom he shall employ or cease to employ, to regulate and manage his business with perfect independence and freedom, provided only that he shall deal lawfully, justly, and honorably with all men.

"I recognize the right of every father to have his son taught, and of every son to learn any lawful trade, as on a plane with his right to a knowledge of reading, writing, or any other branch of learning, and that this right should be subject to regulation only by the laws of the land. I hereby pledge myself in all my relations and intercourse with my employers and fellow-workmen to maintain and live up to these principles."

There was no debate on the adoption of this measure, and action was enthusiastically unanimous, but a general discussion sprang up when it was proposed that the same card of principles be presented for signature to every employer with the pledge thereto changed as follows:

"I hereby pledge myself to maintain and live up to these principles in the prosecution of my business, and to lend my aid to the full extent of my influence and power for their maintenance and protection among my fellow employers. I further pledge myself not to employ any workman except upon his signature of this card of principles."

When it was stated that the pledge meant the discharge of every workman who did not sign the required card, numerous objections were raised, especially by contracting plasterers, carpenters, and stone cutters, who are getting along peaceably with their men and are expecting no trouble. All objections were met with the reply that the card contained nothing not guaranteed by the Constitution of the United States, and that the country had got tired of being shackled by the labor unions.

At length a tacit understanding was reached that the pledge should be voted upon by the delegates individually, they then to go to their associations and urge its ratification. The pledge was thereupon adopted unanimously. June 1 was fixed as the date when the lockout would be declared off and business resumed with the card of principles as the basis.

MONTANA produced in 1886 55,000,000 lb. of copper.

STABILITY OF WALLS AT OPENINGS.

The following article has been written by M. Emile Trelat, architect in chief for the department of the Seine, director of the especial School of Architecture, and has appeared in *Le Genie Civil.* It contains matter of some interest, although some of the defects of which the writer complains do not obtain with English work, as English methods are not always those to which objection is taken.

Fig. 1 shows the manner in which openings in the walls are generally constructed. It will be seen that

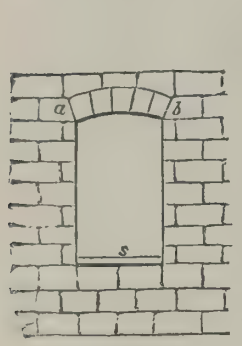


FIG. 1

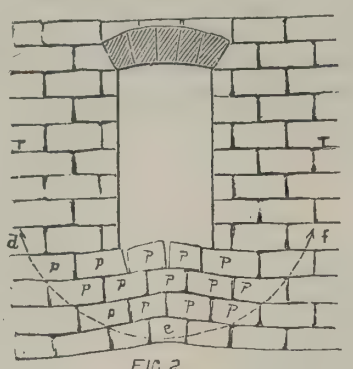


FIG. 2

the courses are simply discontinued at the place where the opening is required, except at the top, where an especial support is added, capable of sustaining the weight which surmounts the bay. This has been the method always pursued, and it is singular that its imperfections have not been recognized. On looking at a nearly finished new building, it may be observed that the stones of the masonry below the bays are displaced and raised up. This deformation gradually develops as the work proceeds. When the edifice is built of hewn stone, the displacement is scarcely perceptible, especially if the blocks are large; but if smaller

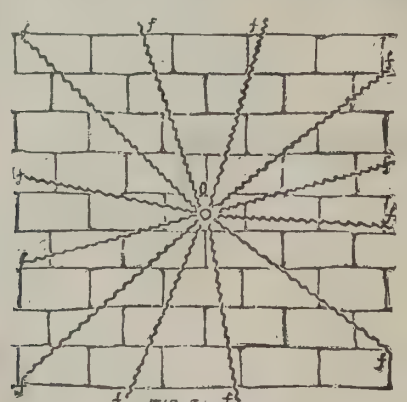


FIG. 3

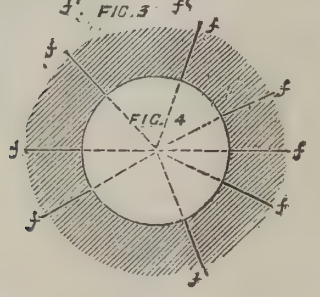
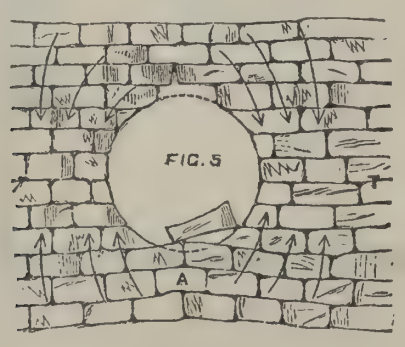


FIG. 4

materials are used, it becomes very considerable. Beyond a certain point the disorder ceases to progress, because under the upheaved layers, Fig. 2, the stones press against each other in one direction, *def*, forming an inverted arch, and the foundations from whence at first arose the dislocation of the stones, *ppp*, bring a resisting force to bear upon the piers, TT. It is on account of these disorders, limited, though not avoided, that the following rule is to be found in all treatises: "The supports and sills of the bays should never be fastened into the masonry of the jambs, and should not be placed until the sinkings have ceased." Economy



requires that the sills, Fig. 1, should be reduced in thickness, which if they were fixed at their extremities would render them liable to break when what is shown at Fig. 2 occurs. Experience shows, therefore, that it is best simply to place the supports and sills between the jambs. Why should not these displacements be avoided by some appliance fixed under the bays? The question is better understood when treated mechanically. Fig. 3 shows a well made wall composed of resistant materials. It is stable and solid, because round any point, *o*, all the forces, *fff*, are equal and opposite, balanced in *o*. If the field of resistance immediately round were partially removed, the displacement of materials would follow until the forces were again balanced by new conditions set up under a new form. For instance, in Fig. 4, the forces, *fff*, or those derived from them, would continue to act on the remaining part of the wall, but the material road by which they joined the meeting point being removed, their direct reactions would be interrupted. Two results may then follow—the materials which border the hole, not being fitted to maintain the place from which the forces, *fff*, tend to remove them, are dislocated, compressed on one side, separated on the other side as in Fig. 5, so that the material path of the direct reaction of the forces becomes in a way reconstituted; but the work is then ruined, as seen by Fig. 5, by the sinking of the piers, TT, which causes the lower stones to rise and the upper ones to sink toward the aperture. The arrows show the direction taken by the derivative forces to accommodate and balance themselves in the new arrangement of the materials unless the opening is bordered by a frame of a material sufficiently resistent to preserve its form and to set up an opposition to the course of the forces, *fff*, etc., as in Fig. 6. If instead of a circular hole, the bay be rectangular, as is generally the case in edifices, Fig. 7, it will be remarked that the forces, *fff*, are all vertical and horizontal, and that the actions and reactions of those that are horizontal are so slight and accidental that it is scarcely necessary to provide against them, while those which act vertically are considerable. Under such circumstances, strength should be exclusively given at the top and the bottom of the bay, Figs. 8 and 9. In summing up these remarks the author insists that every bay should be well protected at the bottom as well as at the top, enabling the jambs to sustain and distribute the vertical changes in pressure and its line of action. He concludes by point-

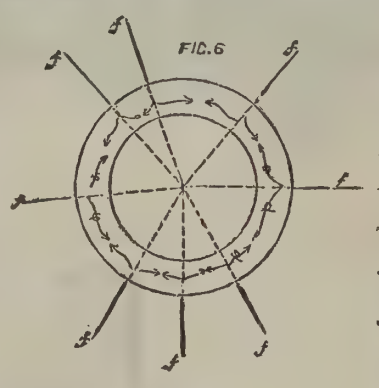


FIG. 6

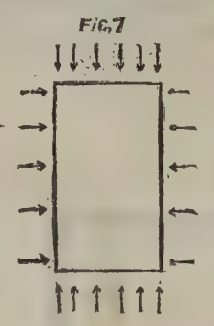


FIG. 7

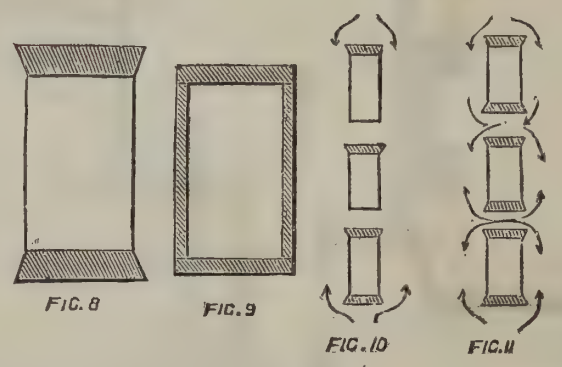


FIG. 8 FIG. 9 FIG. 10 FIG. 11

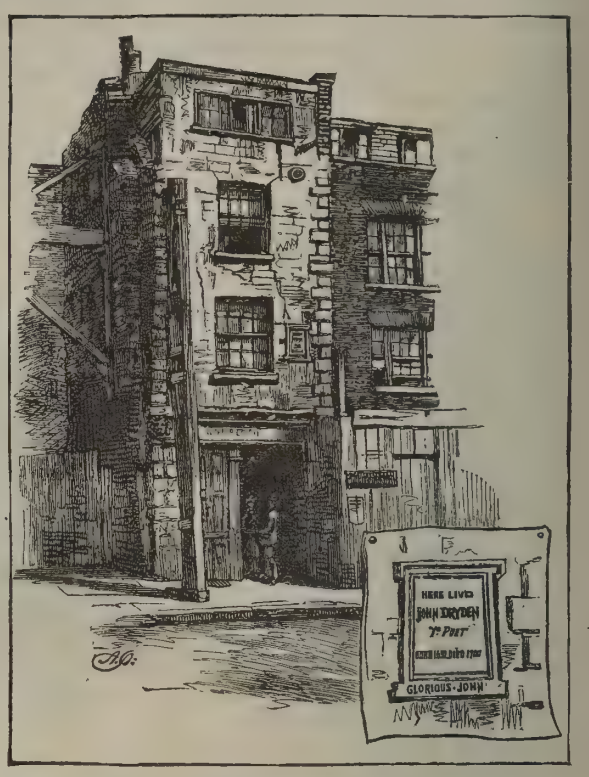
ing out the greater advantages of iron frames for stability and capacity to maintaining the form of the bay. In many storied edifices where the bays are above one another, it may be thought sufficient to strongly sill the bottom of the lowest bay only, as in Fig. 10. But it is far better to do so to the upper and lower parts of every bay, as all materials can thus be better adjusted, and the regularity of the lines maintained.—*The Engineer.*

An Ancient Theater.

To our mind, the most interesting relic of old Syracuse is the Greek theater. This, like the quarries, the catacombs, and the amphitheater, has been cut out of the rock, so that, considering its antiquity, it is in a very much better state of preservation than buildings of a similar character which have been "put together." It was built about 500 years before Christ, and consists of forty-two rows of seats, divided by two corridors, most of which are in excellent preservation. A long pit extends from wing to wing across the semicircular space at the foot of the seats, and this may have been a receptacle for the curtain. Beyond this, confused masses of stone mark the area of the stage proper, from which steps still lead to the cliff above, The view from the theater on a bright, sunny day is a scene not easily forgotten by the spectator, and is only surpassed in Sicily by the view obtained from the theater at Taormina. The eye wanders over the glimmering stonework, across a fertile tract of orchard land, to the deep blue waters of the Greater Port, one of the most magnificent natural harbors in Europe, and beyond this again to the low swampy shore of the peninsula of Plemmyrium, now known as Isola, and famous for the wine of that name. Not a sound breaks upon the ear as we sit here and sentimentalize. Despite the bright scene, we feel that we are in a land of the dead, and find it hard to realize that all around rose a city called by Cicero "largest of Greek cities, and most beautiful"—that the unbroken surface of the blue waters stretching away before us was once alive with the navy of a great nation and the argosies of every commercial state in the ancient world. The lizards dart about the sunlit stones, birds flutter in and out of the ancient vestibules and retiring rooms, but we are alone, and are thankful for it.—*London Society.*

THE HOUSE OF JOHN DRYDEN.

The demolition of an old house in Fetter Lane, upon which the inscribed tablet bears witness that it was



THE HOUSE OF JOHN DRYDEN, IN FETTER LANE.

once the residence of Dryden, removes one of the few remaining antiquarian relics of a period, nearly two centuries ago, when most of the "men of wit about town," especially the professional authors, inhabited the narrow streets and courts north of Temple Bar and the upper part of Fleet Street. Dryden and Otway, rival dramatists but friendly companions, lived directly opposite each other in Fetter Lane. Otway called one morning at breakfast time, and was told that Dryden was out—that he had gone to breakfast with the Earl of Pembroke. The poet of "Venice Preserved" said he would call again; he did so, and was informed that Dryden was gone to see the Duke of Buckingham. A little disappointed, but not mortified with jealousy, Otway took a piece of chalk that lay on the table, stepped outside the front door, and wrote

BACK OF DRYDEN'S HOUSE, IN FETTER LANE.

upon it, what was true and kindly meant, "Here lives Dryden, a poet and a wit." Presently, Dryden came home, saw the writing, took the chalk, and added a second line, "This was written by Otway, *opposite.*" It was certainly a rude piece of verse, for such a masterly hand; but we do not like to believe that Otway took offense at the joke, as intended to signify that *he* was the opposite to a poet and wit. Dryden's publisher, Jacob Tonson, had a shop near the Inner Temple gate.—*Illustrated London News.*

Gable Window

Dormer Entrance

Bracketted Gable Window

Oriel Angle Bay

Detail of Stair Case Bay Window

Entrance

Sci. Am. N.Y.

A $20,000 RESIDENCE . W. H. BEERS., Architect, NEW YORK.

[For description see page 134.]

HEATHCOURT, MAIDENHEAD.

Our illustration represents a house recently erected for Mr. Arthur Lawrence at one of the most attractive spots near London, bordering on the well known Maidenhead Thicket, and adjoining the old London and Bath high roads. The ground is high, about 1½ miles from the railway station, and in a locality rapidly and deservedly becoming very popular. The building has been constructed in red brick with Doulting stone dressings and Broseley tiles. Mr. Arthur Vernón, of 26 Great George Street, Westminster, is the architect. —*Building News.*

A SUBURBAN RESIDENCE.

We publish an admirably planned and picturesque design of a suburban residence, by Mr. Wm. H. Beers, architect, New York. The house has been designed to occupy a corner lot, with a frontage of one hundred feet on the main street and two hundred on the side street, giving ample room for a stable in the rear of the lot. The house has an extreme frontage of 55 feet by 65 feet in depth. All the principal rooms on the first and second floors have an outlook on the main street; and while the dining room is in the rear of the library, a view of the main street is possible, as here has been thrown out an octagonal projection, producing a very pretty effect, both as to exterior and interior. This projection is carried up two stories, giving the same advantage to the chamber over dining room, with the addition of a second story piazza off this room.

The exterior of the house on first story is finished with clapboards and trimmed with corner boards, belt courses, etc , as shown on the drawing, and over each window is placed a swinging transom glazed with stained glass. These transoms are very pretty in their interior effect, and also furnish an excellent means for ventilation, when opened, in connection with the open fireplaces in each room. The second story is carried out in the "Old English" half-timbered style, with the panels filled in with round cut shingles. On the front there is a gable extending half the width of the house, with a very effective group of windows in same. The panels in this gable are filled with shingles, carved woodwork, rope twisted in artistic designs, secured to the wood, and finished in bronze, producing an excellent effect.

The two most beautiful and striking effects produced are the bay windows—at corner of house on second story, and the bay which forms the staircase landing. These two superbly designed windows are equally effective in their interior effects. The chimneys are tall, and are quite an architectural feature in themselves, and in the library chimney there is a window over mantel shelf filled with an artistic piece of stained glass work. On all sides of the building there is some interesting architectural feature or bit of detail that pleases the eye. Passing up the front steps on to the piazza, which runs across the front and side of the building, you enter the house through a large vestibule, finished in "old English oak," highly polished, with vestibule door and side filled with beveled plate glass, entering a wide hall, finished in "quartered oak," with wainscoting five feet high, and panels of wainscot filled in with relief work, finished in old silver. A hat rack with large mirror, built in, and forming part of the wainscot, is placed beyond the parlor doors. In the rear of the hall, facing the front entrance doors, is a large and massive oak mantel, with tile hearth and facings; frame and andirons finished in old silver.

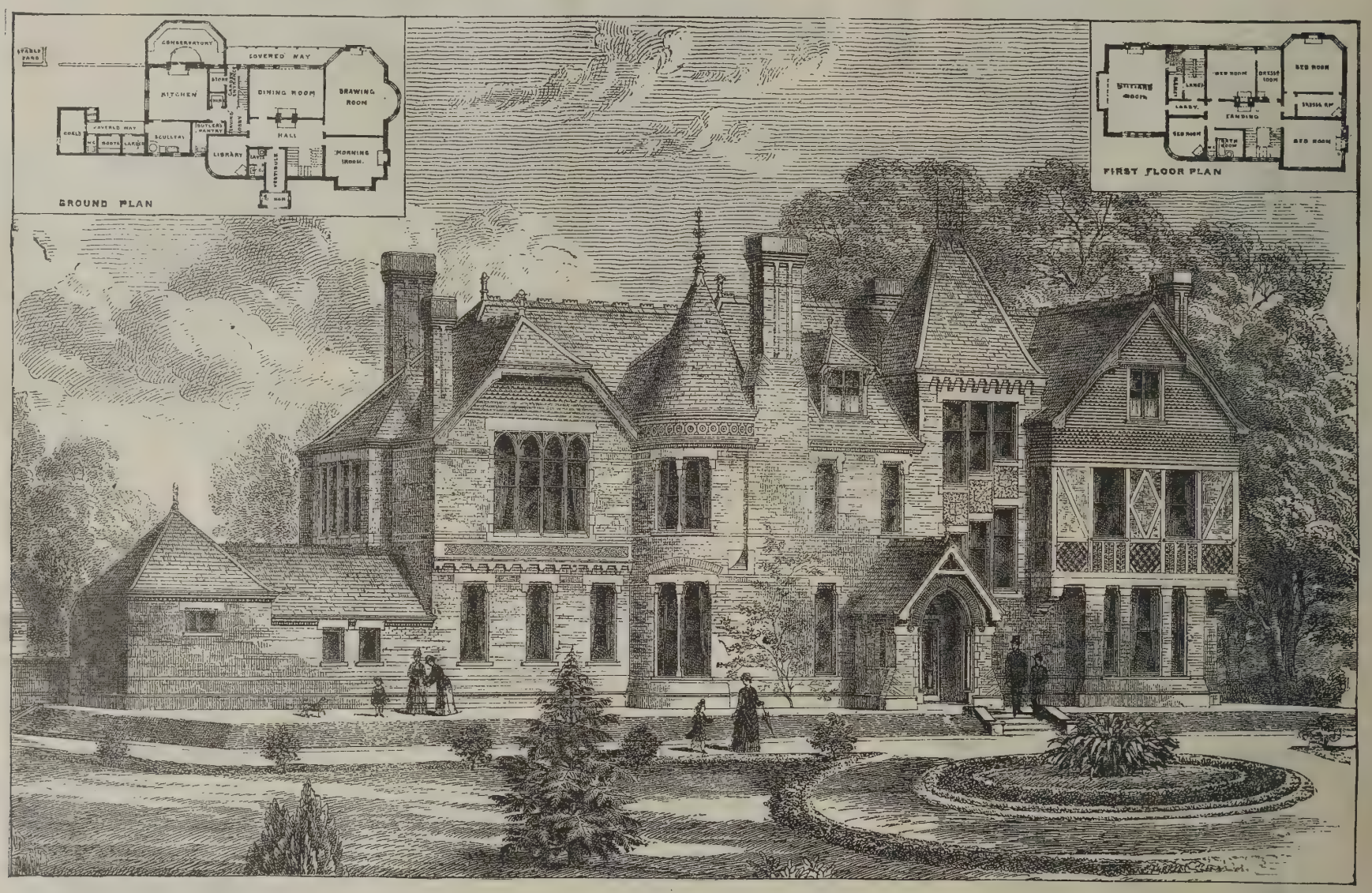
The principal feature in the house is the staircase at the right of the mantel. This staircase, occupying as it does the full width of the staircase hall, is built in quartered oak. The first flight of steps are six feet wide, flanked on the right by a massive carved newel, with a "dragon" holding a newel light finished in old silver. After ascending the six steps you reach a broad gallery, running the full width of the hall, with rail, newel, and an open screen, with carved posts, spindles, etc., dividing gallery from the hall proper. With a rug on the floor, and a few tropical plants placed about, this makes an effective and desirable resting place. Ascending a short flight of six steps, you reach the second gallery or bay window landing, with upholstered seats about windows in bay. This beautiful window produces a truly magnificent effect, with its fine stained glass, reflecting its various colors in the hall below. From this landing, by ascending six steps more, you arrive at the level of the second story. On the right of the entrance hall you enter the library through large sliding door opening, and find this room finished in dark antique mahogany, finished with a high polish, and a large, massive mantel running to ceiling. In front of room there are a charming group of three windows with their broad panes of plate glass looking out on the main street. At the opposite end of this room, on each side of the large sliding door opening, leading to dining room, are low bookcases with silk curtains hanging from brass rods. The remaining wall space in this room is reserved for furniture.

Passing from the library into the dining room, you find a large, spacious room with a large mantel, in English oak, facing you as you enter from library, while at the end of the room an octagonal bay has been thrown out to give a view of the main street. With its broad sheets of plate glass, the stained glass above gives this room a very cheerful effect. The buffet and mantel are in one, the buffet extended on each side of the chimney, which as designed produces a novel and pretty effect. All the wood in this room is "old English oak," finished to a dull gloss.

Passing from this massive room, we enter the drawing room, which is finished in white maple, with elaborately carved mantel and trim. This room is carpeted with carpet in the most delicate colors, while the side walls and ceiling are decorated in delicate shades of cream, pink, and gold. All the rooms, except drawing room, have parquet floors. The kitchen, laundry, pantries, etc., are as perfect in their arrangement and details as could be desired, and as a study of the plans will reveal.

On the second floor all the chambers are light and cheerful, and have a pleasant outlook, and are finished in white maple, cherry in its natural color, and white ash, all rubbed down and brought to a high polish. The bath room is finished in white maple, with cream white tile dado, four feet high, and tiled floor. Some of the bed rooms have dressing rooms adjoining, and each chamber has from one to two large closets fitted up with shelves and drawers.

In the attic there are a number of servants' rooms, trunk rooms, packing room, etc., all fitted up complete in every detail. The cellar is large, open, and light, with a large hot air furnace which heats the whole house perfectly. There is also a large storage refrigerator, inclosed with brick walls, and built in a most perfect manner. The cost is estimated at about twenty thousand dollars.



RESIDENCE OF MR. ARTHUR LAWRENCE, MAIDENHEAD THICKET, BERKS, NEAR LONDON.—ARTHUR VERNON, ARCHITECT.

Egyptian Reliefs.

The wall was first chiseled as smooth as possible, the imperfections of the stone were filled up with cement or plaster, and the whole was rubbed smooth and covered with a colored wash. Lines were then ruled perpendicularly and horizontally with red color, forming squares all over the wall, corresponding with the proportions of the figures to be drawn upon it. The subjects of the painting and of the hieroglyphics were then drawn on the wall with a red line, most probably by the priest or chief scribe, or by some inferior artist, from a document divided into similar squares. Then came the chief artist, who went over every figure and hieroglyphic with a black line and a firm and steady hand, giving expression to each curve, deviating here and confirming there the former red line. The line then traced was then followed by the sculptor. In this stage there are instances of a foot or head having been completely sculptured, while the rest of the figure remains in outline. The next process was to paint the figure in the prescribed colors, and in some cases the painted line deviates from the sculptured line, showing that the painter was the more important workman, and that even in this last process no possible improvement was omitted. There are other instances where a considerable deviation from the position of a leg or arm has been made after the sculpture was finished and painted; the part was recarved and the defective portion filled in with plaster, which, having since fallen out, furnishes us with this curious evidence of their practice.—*Owen Jones.*

FLOORS AND CEILINGS: ANCIENT AND MODERN.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

(*Continued from page* 117.)

III.—JAPAN—THE MODERN HOUSE.

According to Fauld, however humble a Japanese home, it is always guarded by a moat. In a feudal mansion the moat was usually deep enough to prove a genuine obstacle. We should call the modern moat a gutter. While it is still almost universally retained, the muddy water is hid in the summer time by duckweed or the broad leaves of the lotus. Even in front of the humblest dwellings is the inevitable miniature moat, which is often dry, of a foot or so in breadth, and at most about two inches deep. These moats or gutters are lined with stone in receding layers, in the better class of dwellings. The humble habitations have their moats lined by thin pine boards pegged down into the ground. As their sides and bottoms are of course open to absorb the drainage, and as all the surface sewage passes into them, the sanitary results are sometimes disastrous.

Approaching the gate, we are awed by a massive arrangement of black wood. Its form, in some cases, approaches that of the so-called "bird rest" in front of Japanese temples. The wall or fence may consist of bamboos, whole or split, or of thin wooden planks blackened with a mixture of India ink and the juice of the unripe persimmon, which is highly bitter, astringent, and antiseptic, preserving the wood for a long time.

In the houses of some pretensions there is an embankment behind the moat, topped by a quick-set hedge of either holly, privet, camellia, or the like. Behind this there is either the fence already described or a wall composed of thin tiles laid horizontally, with much white shell lime; or a bamboo lath and plaster wall, sometimes covered by diamond shape tiles, the joining lines of which are concealed by diagonals of white lime laid on smoothly, rounded, and as thick as three fingers This has a pleasing appearance, quite characteristic of Japanese architecture. As the name of the street is not to be found at the street corners, it is repeated at every doorway. The towns are divided into wards and blocks, and the numbers of the houses are often confused and misleading.

A slip of whitewood is nailed on one of the posts of the gate and is inscribed with the name of the street or block, the number, name of householder, numbers and sexes of household. Besides this combined street sign and door plate there is often a charm to keep away the wolf from the door, an animal which was literally once known in the vicinity of Tokio, and greatly dreaded. Within the porch there are racks for halberts and other grotesque instruments of formidable shapes. These accouterments have been removed, but the racks still remain, the traditional sign post of an obsolete custom. The gates of the larger houses are heavy, and are adorned with copper or bronze mountings, and often studded with large nails.

Upon entering the gate you find a court, from the several sides of which the open verandas of the building may be approached, Entrance to the high verandas is effected by means of heavy wooden stairs. The court is sometimes paved with water-worn stones, larger than a goose egg. Sometimes it is level, weedless, perfectly well swept earth, and in either case lines of smooth stepping stones are placed in the regular pathways.

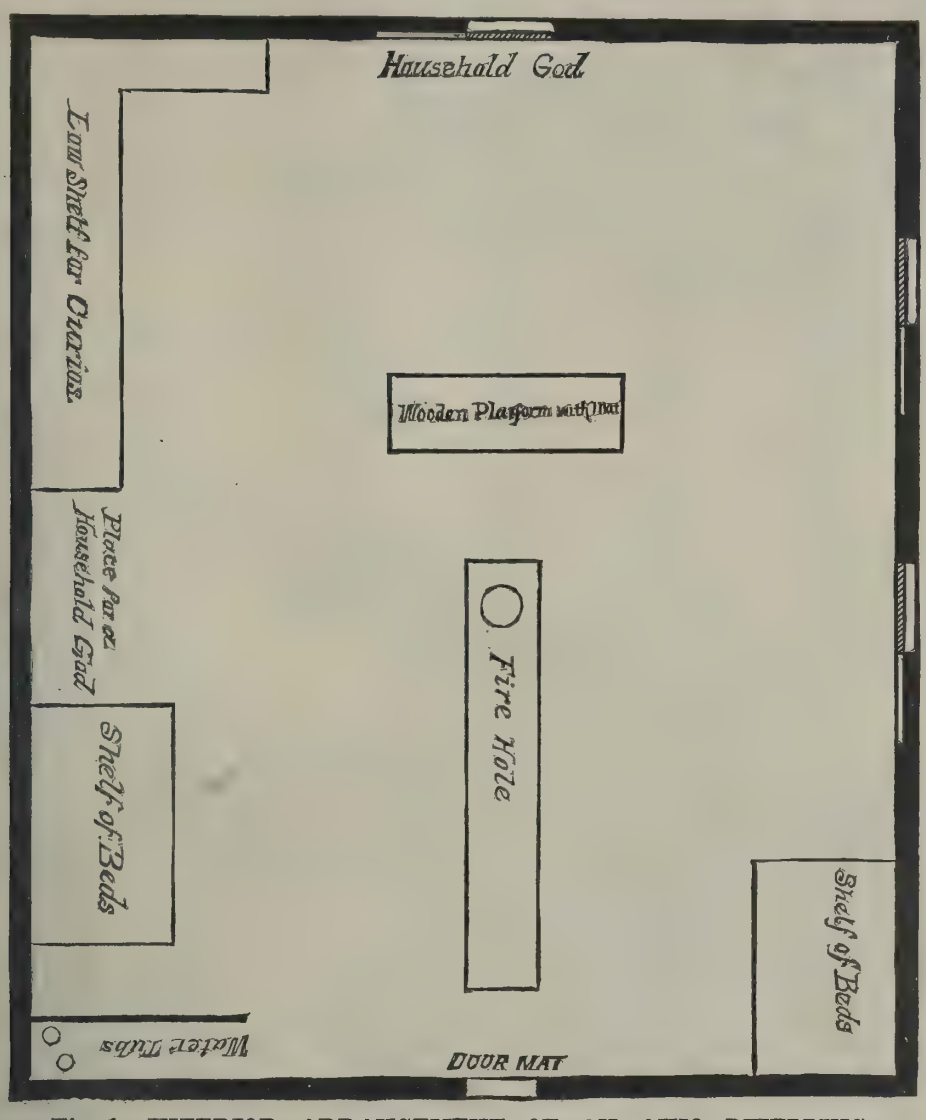


Fig. 1.—INTERIOR ARRANGEMENT OF AN AINO DWELLING.

Fig. 2.—AINO HOUSE YEZO.

The gardens, even of somewhat humble mansions, are often graced with carved stone lanterns. The roof is of black tiles in Tokio, and the darkness of the clay from which they are made is due to the presence of organic matter. In the poorer houses, wooden shingles are sometimes used.

In front of the doorway is a small space unfloored, called the *doma*, where you take off your shoes after announcing yourself in the words, "O tonomi mosu" ("I beseech you") or by ringing a gong suspended from the door post. The beams supporting the roof are ponderous. The walls are hung with paper lanterns, and there is a range of white wooden fire buckets, all stamped with the crest of the owner. Some of the lanterns are cylindrical, and open out like a concertina. They are suspended from a hooked stick, and are similar to those that were used in ancient Egypt. In one part of the house, according to Mr. Fauld, is the altar shelf, on which images of saints or sages or pictures of ancestors may be seen, with incense tapers burning before them by day and lamps at night. Photographs of the dead are often honored in this way. In drawing Fig. 1 we show the interior arrangement of an Aino dwelling, in which the position of the altar shelf is indicated by a diagram. It is sometimes called the ancestral shelf.

Fig. 4.—A MODERN JAPANESE HOME.

In the walls are recesses with sliding doors, into which the bedding is thrust in the day time. Clothes are kept in plaited bamboo boxes, usually covered with black or dark green water proof paper. The furniture is very simple. There are often in the best houses no chairs, no stools, no tables, no bedsteads. There may be some low short-legged side tables of characteristic Japanese pattern and one or two costly vases or other ornaments, a few scroll pictures, which are changed in deference to guests and seasons, some flowers or dwarf trees in vases and a lamp or two. In summer a well planned Japanese house is the very ideal of coolness, grace, and comfort. In winter it is the realized dream of misery. Fire places are unknown, and the ventilation is conspicuous by its absence. The walls within are wainscoted and hung with painted and variously colored paper. Mr. Hildreth, the historian, suggests the probability of the derivation of paper hangings as a substitute for tapestry from this circumstance. To every house is attached a back yard, which, though never so small, yet always contains some curious and beautiful plants, and they are attended to with a great deal of care. In Fig. 2 is shown an Aino house, by permission of Prof. Morse and his publishers, Messrs. Ticknor & Co. In Fig. 4 the street view of modern house in Tokio, and in Fig. 5 the framing plan of an ordinary two storied house, a description of which we take from "Japanese Homes and their Surroundings." The Japanese standard of measurement is a *sun*, which is nearly equal to our *foot*, and is divided

Fig. 3.—A STREET SCENE IN KIOTO.

into tenths. The wood employed in the frame is usually cedar or pine. The corner posts, as well as the other large upright supports, called *has hira* (H), are square, and five tenths of a foot in thickness; these are tenoned into the plate upon which they rest. This plate is shown at D. It is made of cedar and sometimes of chestnut. Its cross section is six tenths of a foot square, and rests directly on a number of stones, F. Between the principal uprights smaller uprights or studding are placed as indicated at B, and the cross section is two tenths of a foot square. Through these pass the cross pieces called *nuki* (see A). They are four tenths of a foot wide and one tenth of a foot thick. To these are fastened bamboo slats, the substitute for laths. The horizontal beam to support the joists of the second story floor is called the *nikai bari* (shown at C). This is of pine, with a vertical depth of one and two tenths feet, and a width of six tenths of a foot. The rafters of the roof, called *yane shita* (see I), in this frame are nine feet long, three tenths of a foot wide, and eight tenths of a foot in depth, thus showing that they recognize the engineering axiom that with any given cross sectional area the deepest beam is the strongest, if prevented from lateral motion. Cross beams (see J) from the upper plate are called *taru ki*. From them spring short posts to support the ridge pole. The first floor is sustained by posts that rest on stones embedded in the ground, as well as by a beam called *yuka shita* (E). This is secured to the upright beams at the height of one and one half or two feet above the lower plates. The upper floor joists are of pine, two inches square. The flooring boards are six tenths of a foot in thickness and one foot wide. The lower floor joists, called *neda maruta* (G), are rough round sticks, three feet in diameter, hewn on opposite sides. On top of these rest pine boards six tenths of a foot in thickness.

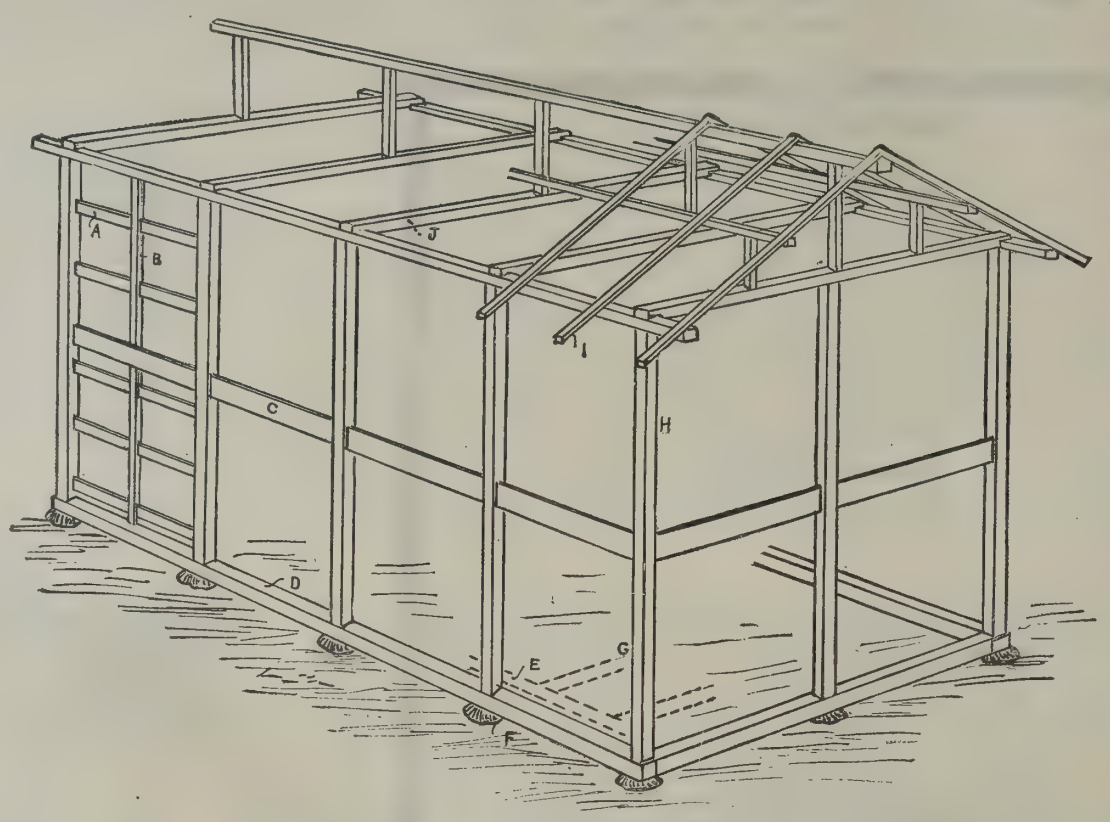


Fig. 5.—FRAMING OF AN ORDINARY TWO STORIED HOUSE.

In Fig. 3 we show a street scene in Kioto, one of the most beautiful cities of the Japanese empire. Japan is a land of littles. Their most beautiful objects are generally little. The knob of a stick or the button of a tobacco pouch is often an art work of the highest elaboration, and their dainty foods are served in small portions. It is also a land of earthquakes, and this brings us to one of the most singular facts connected with the structure of Japanese buildings—a method adopted with the special view of insuring safety during these periods of the earth's vibrations. Japanese houses and temples are put together in a solid and simple manner, each work being complete in itself, and having an altogether independent existence. Thus, a Japanese house is in no way built upon foundations, or fixed to the ground on which it rests. It stands upon a series of legs, and these legs usually rest on round-topped stones of such a height as will during the rainy season support the timber uprights above any water that may lie upon the ground. In Fig. 5, showing the framing of an ordinary dwelling, which we have taken by permission from Prof. Morse's "Japanese Homes and their Surroundings," this arrangement of short posts upon foundation stones is very well shown.

It is obvious that while an object fixed to the earth might if rocked be broken off from the ground, or become strained and destroyed, that which is loose would simply oscillate and settle down again after the vibration had ceased, whereas, if the posts were fixed, the application of a small amount of pressure on the upper part (especially if the top was heavy), or any upheaving of a portion of the ground on which it rests, would be likely to do it an injury or effect its destruction.

Pagodas are often of great height, yet many have existed for seven hundred years, and have withstood successfully the many vibrations of the ground, which must have inevitably achieved their overthrow had they been erections of stone or brick.

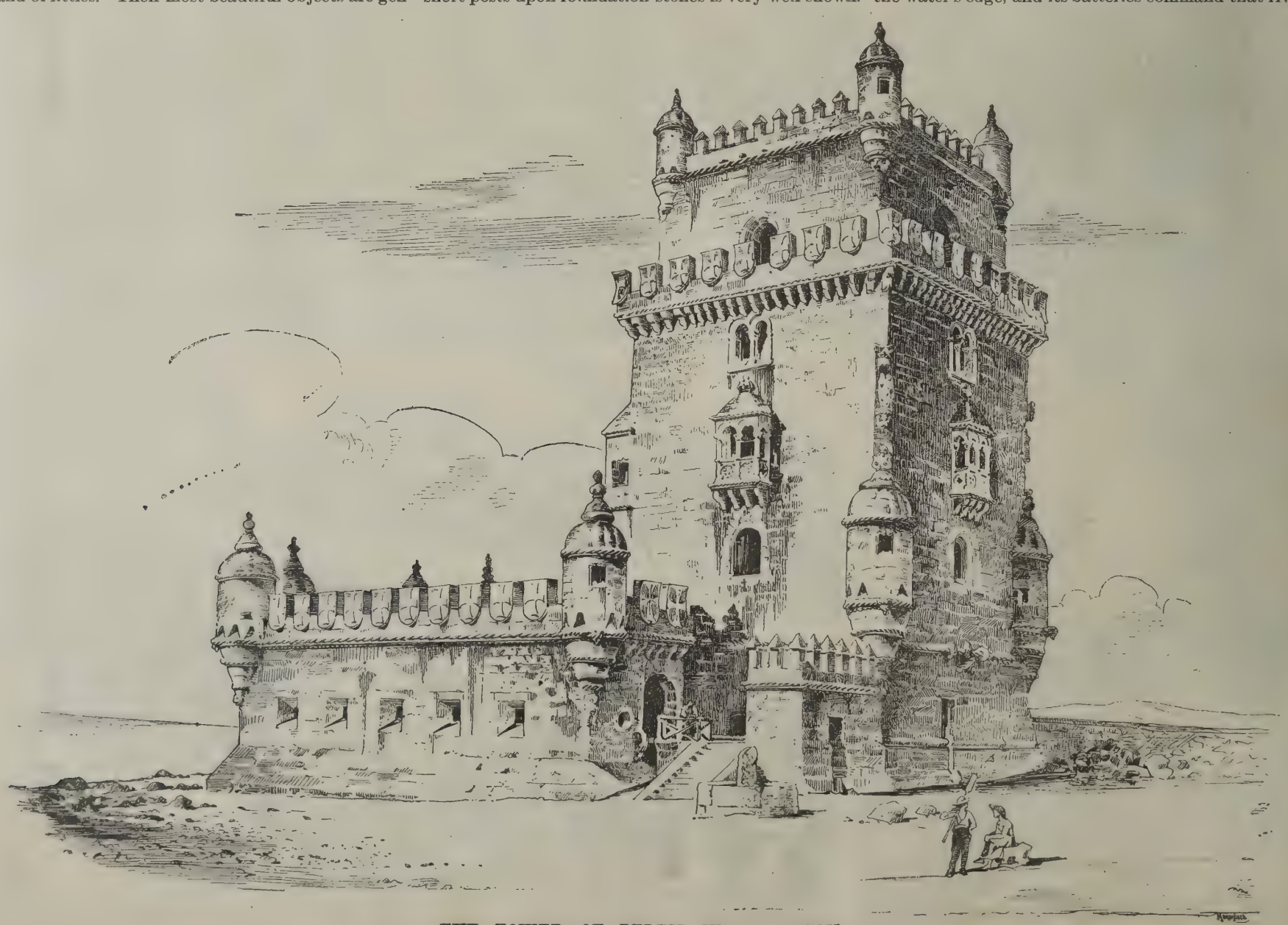
(To be continued.)

Portugal Laurels by the Seaside.

For general planting near the sea, the best shrubs are to be found among evergreens, though some of these do not appear to thrive any better than the deciduous trees, and among the worst is the Portugul laurel. Within the shelter of the low walls in front of the villa gardens facing the beach it grows, but above the shelter of the wall it makes no progress, and the tops look as if they had been scorched by fire. Beside the Portugal laurel, and fully exposed to the blast—and we should say within reach of the spray from the sea—the laurustinus thrives amazingly, making a large and densely furnished bush, such as is seldom seen in inland situations. It is quite a substitute for the laurel.

THE TOWER OF BELEM.

The annexed engraving, taken from *Architektonische Rundschau*, represents the singularly picturesque fortress called the Torre de Belem, which was erected about the end of the fifteenth century, in the town of Belem, a suburb of Lisbon, Portugal. The building is situated on the north bank of the Tagus, close to the water's edge, and its batteries command that river.



THE TOWER OF BELEM, NEAR LISBON.

RESTORATION OF ROMAN RUIN AT REIMS, FRANCE.

The gate known as the Porte de Mars at Reims, in France, one arch of which has been recently restored, a first step toward the restoration of the whole monument, is the only one remaining of four similar gates or triumphal arches which were used in the city of Reims while under the dominion of Rome. It consists of three arches and eight columns of the Corinthian order, measuring 42½ feet in height. The middle arch, which is the largest, measures 49 feet in width and 38 feet in height. It is called the Arch of the Seasons, and the sculptor had represented the twelve months of the year. Unfortunately, five of these bass-reliefs are al most entirely destroyed, and the seven others are very much damaged. The left hand arch is called the Arch of Remus, and represents Romulus and Remus under the wolf, and at the right and left of the children are standing figures of Faustulus and Acca Laurentia. The arch at the right is called that of Leda, and represents Leda and the swan, with a Cupid carrying a torch above them.

Until 1544 the Porte de Mars was actually used as the gate of Reims, but at that time, owing to the growth of the city, it became necessary to carry the gates further out, and the Porte de Mars is found buried (incredible to believe) under the rubbish brought there for leveling the new routes. Discovered and unearthed in 1812, the government has recently classed it among the monuments of historical interest, and has voted, in conjunction with the municipal government, the funds necessary for the preservation and restoration of this important ruin.—*L'Illustration.*

THE HISTORIC MONUMENTS OF FRANCE—THE ROMAN ARCH OF MARS, AT REIMS.

The Equitable Building, New York.

Another wonder has been added to the many—of an architectural kind—to be found in New York, and that is the court or arcade of the remodeled Equitable Life Assurance building, on lower Broadway, opened on May 2 for the first time.

The court is in the center of the building on the ground floor, and is 100 feet long, 44 feet wide, and 30 feet high. Its walls, for their entire height, are made of highly polished Ste. Baume granite. Double pillars of the same material are ranged along the sides of the walls at regular intervals. Their bases are made of Knoxville (Tenn.) marble and their capitals of Algerian onyx, all highly polished, and producing a beautiful effect. Around the tops of the columns runs a layer of polished Knoxville marble, then a layer of dark Italian marble, then another layer of Knoxville marble, from which the arched roof of the court springs in a graceful, symmetrical curve.

The roof or dome of the arcade is of prettily designed stained glass and rests on arches of Knoxville marble, in which panels of bright polished Italian marble are set.

The floor of the arcade is tessellated, white and pink marble being used in its construction, and being set in squares, with diamonds cut in each corner and a circular piece of pink marble set in the center of each.

At the end of the arcade is the wide marble staircase that runs up through the entire eleven stories to the roof. Above the first story the railing is of iron, in fancy and elaborate design, neatly gilded and painted, but on the first story the balustrades are of pure Mexican onyx, beautifully carved, and are capped by a huge rail of polished granite. The newels of this staircase are also of Mexican onyx, a foot thick. They are surmounted by two bronze figures, which are to support candelabra of electric lights, and on their face have the monogram of the society, "E. L. A. S.," in big letters of polished brass.

At the eastern end of the arcade, in the arch of the dome, there is a panel of mosaic work that is said to be one of the finest things of the kind in this country. In its center is the draped figure of a woman seated on a dais, with her hands about two children on either side of her, as though protecting them from some impending danger. On either side of the figures of the woman and children are those of two warriors—Greek in spirit—one of whom holds a sword and the other a spear, and under the panel the motto of the society, "Vigilance and strength defend the defenseless."

The arcade was crowded with people on the opening day, and every one of them, after they had explored all the beauties of the place, returned to get another look at the wonderful mosaic.

The arcade is reached by the main entrance on Broadway, a hallway twenty-two feet wide, in the construction of which the same materials were used as in the arcade, and running from the arcade through to Nassau Street is another wide hallway which is intersected at right angles by the hallways running from Pine and Cedar Streets. In all these hallways, which are brilliantly lit up with electric lights, the walls are of Ste. Baume granite, the columns of the same material, with bases of Knoxville marble and capitals of Algerian onyx.

The frames of all the doors and windows in these hallways are of old English oak, elaborately and beautifully carved. This oak lay in a lumber yard in England for sixty years, and was imported by the life assurance society for the very use to which it has been put.

Along the sides of the hall leading to Nassau Street there are to be erected a lot of shops or booths, which will be called "a bazar of all nations," where one can buy anything from a toothpick to a theater ticket. These will be opened in a few days.

It was on May 1, 1886, that the alterations on the Equitable Life building were commenced, and now the work is practically done. In that time two immense buildings were torn down, one side was taken out of the Equitable building itself, almost its entire interior was remodeled and another story was added to it, and the huge wing on the corner of Pine Street built from the foundations up.

It was a tremendous job, and an army of men were kept at work day and night in the whole of that time. Mr. Henry B. Hyde, the president of the society, personally watched every detail of the work, which was under the direction of George B. Post, the architect, and David H. King, Jr., the general contractor. No less than thirty-one sub-contractors were employed on the work.

"We worked night and day," said Mr. Hyde to a *Herald* reporter, "and now everything is ship shape. Our building covers an acre of ground, and has six hundred offices in it, less than twenty of which yet remain unrented. You may get an idea of the work we have done when I tell you that about a year ago all the granite and marble used in the new portion of the building lay in the quarries uncut and untouched."—*N. Y. Herald.*

Enameled Brick of Different Colors.

A building brick which is in use in England and Germany is covered with an enameling compound made as follows: One hundred and fifty parts fluorspar, 60 parts Paris white, 50 parts lime, 50 parts oxide of tin, and 50 parts kaolin. These ingredients are pulverized and triturated to an impalpable powder, and reduced to a homogeneous mass, which is calcined in a crucible. After it has cooled it is again reduced to a powder. Water is added and the mass is ground to the consistency of cream. The portion of the brick to be enameled is then dipped into it and the brick submitted in fire clay cases to a heat which fuses the enameling compound. A black enamel is produced by adding to the ingredients mentioned above black oxide of cobalt, black oxide of manganese, and umber previous to the pulverizing and calcining. Blue enamel can be made by adding black oxide of cobalt; green by adding sub-oxide of copper; red by adding sub-oxide of copper and red oxide of iron.

Preservative Fire-proof Paint.

To the Editor of the Scientific American:

I give you, and the many intelligent readers of your valuable journal, a recipe for the best fire-proof paint extant.

Take equal quantities of common salt, alum, soluble glass, and tungstate of soda, four parts lime or lead; mix with linseed oil to proper consistency; put on three coats. It is fire-proof, and posts and other woods exposed to the weather will last 30 to 60 years.

F. M. SHIELDS.

Coopwood, Miss.

WARNER'S IMPROVED DRY PLATE HOLDER.

One of the most serious annoyances a photographer has to contend with in the present day of lightning dry plates is a leaky plate holder, particularly when the latter is composed of one or more separable parts, since the slightest trace of light entering at some minute crevice will frequently damage a day's work. By its simplicity, solidity, and ease of operating, the holder here shown possesses features very desirable for out of door photography, in that it is perfectly light tight, strong, and compact.

Fig. 1 represents a longitudinal section, in which the upper slide is withdrawn. The body of the holder consists of a light hardwood frame, having a metal or gelatinized fiber septum in the center, upon each side of which are riveted very light flat steel springs, shown clearly in Fig. 2. In the lower half of the holder (Fig. 1) may be seen a plate in position. An angular metal strip is rigidly secured on the left hand end of the inside of each plate compartment, intended to hold one end of the sensitive plate, while at the opposite end is a movable or pivoted angular strip or clamp provided with projecting ends, which, when thrown up, permits the sensitive plate to freely drop down into the holder, resting, as it were, upon a bed of springs.

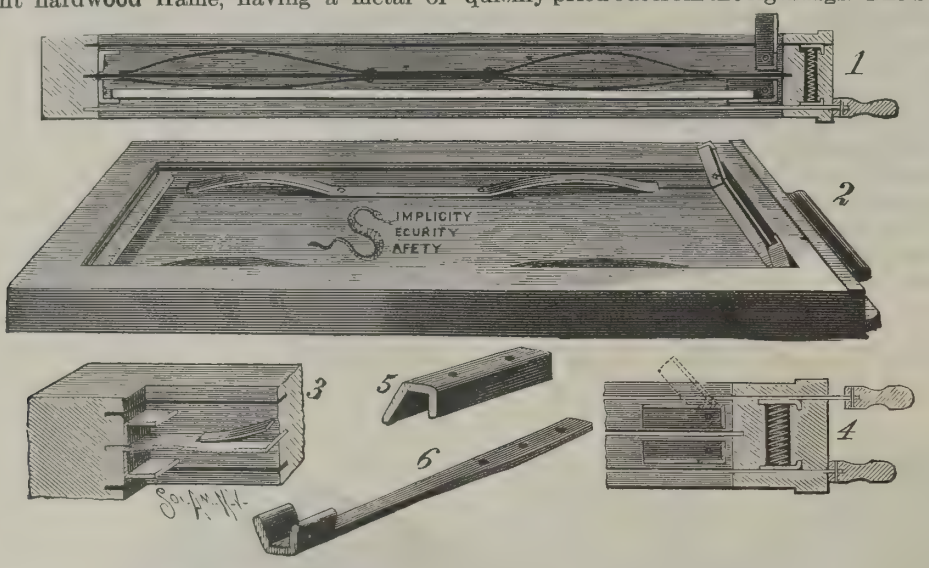
To insert the plate, the holder is held with its narrow end resting on a support at a slight angle, then the exposing slide is withdrawn, and the plate, film side out toward the operator, is slid over the spring under the left hand angular strip. In this position the other free end of the plate projects slightly above the holder. The right hand clamp is now turned down over the end of the plate, pressing the same down into position. The springs compensate for any variability in the thickness of the glass. Hence the film side of the plate remains always in the same plane and in focus. The exposing slide is next inserted, and the holder is filled ready for use.

The pivoted clamp, it will be noticed, has the pivot located just one side of the center, and as it is turned down over the plate, the latter pushes past the line of the pivot, thus securely locking the plate. The upward pressure of the plate cannot open the clamp. The latter is also held by friction on the sides of the holder.

Special cut off light valves, consisting of plates with one side bent down, forming an angle, to prevent slipping, and also arranged to fly outward by a miniature spiral spring between them, as the slide is withdrawn, and effectually close the slit, may be seen in Figs. 1 and 4.

In removing the sensitive plate, the pivoted clamp is first turned up. At once the springs underneath force one end of the plate up and out of the holder, when it is easily caught with the fingers and slipped out. This feature of the holder is quite important, since in ordinary holders the operator is obliged in many cases to dig out, as it were, the plates with the fingers, being very apt to injure or scratch portions of the film. Fig. 3 is an enlarged view of the rigid angular strip. Fig. 4 shows the pivoted clamps down, when holding the plates. The dotted line indicates the position when thrown up.

Fig. 5 represents another form of a rigid angular strip, made in one or two lengths, intended to be substituted for that shown in Fig. 3, with the bevel side downward, and in conjunction with two spring clamps, bent in the shape of a half bow, secured to the inside end of the holder in place of the pivoted clamp. With this latter device the plate is inserted by putting its lower end in the two spring bow forks, then by pressing down on the edge the plate until its upper end slides under and snaps, or pushes up into the rigid beveled lugs in the upper end of the holder. To remove the plate a knife blade or a thin steel key is passed over the upper edge of the plate. Then by pressing down it is quickly pried out from the rigid lugs. The beveled shape of the latter is intended to compensate for the varying thickness of plates.



WARNER'S IMPROVED DRY PLATE HOLDER.

The holder being made in one piece is perfectly tight, while the arrangement of the clamps permits uneven and rough-edged plates to be quickly and easily inserted.

It should also be mentioned that the slides of the holder are made of gelatinized fiber, a new material, light and as enduring as steel and not affected by moisture. The surface is slightly roughened and may be written upon, serving as a memorandum of exposures. The inventor claims that by substituting this fiber for metal, together with the other features, he has an extremely light holder, one that, in fact, is without a peer for convenience and safety.

Further particulars may be had from the patentee, Mr. M. P. Warner, 69 Lincoln Street, Holyoke, Mass., who, we understand, desires to negotiate for the sale of territorial rights.

UNLOADING GRAIN.

Mr. M. H. C. Gardner of Orange Co., N. Y., writes as follows to *The Rural New-Yorker:*

"One of the most tiresome jobs in the busy days of thrashing is to put the grain up in the granary, while the machine stops for a rest. The bags must be emptied, and quickly, as time is precious and all hands have to work hard to feed the machine and take care of the straw, so that when it stops men are usually not in the humor to carry away 75 to 150 bushels and empty it into bins up a pair of stairs. The thrashers who come and thrash my grain, year after year, all say my way of hoisting wheat or other grain "beats 'em all." Back the loaded wagon to the elevator, which rests on a platform level with the wagon, place the bags on the elevator, and the horse instantly raises it to tne second floor, where men empty the bags into bins. It is surprising how quickly 100 bushels can be unloaded without any straining or unnecessary lifting. The contrivance is simple to construct. It can be made with saw, hammer, and nails, or it may be mortised together."

UNLOADING GRAIN.

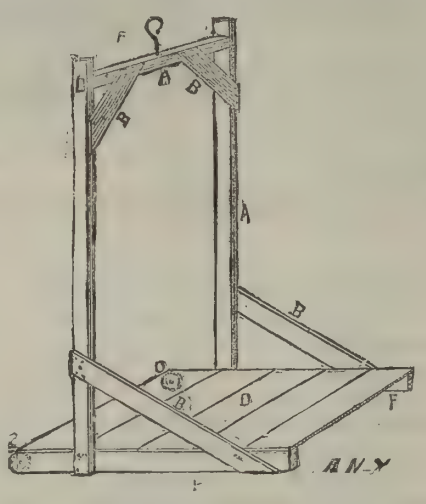


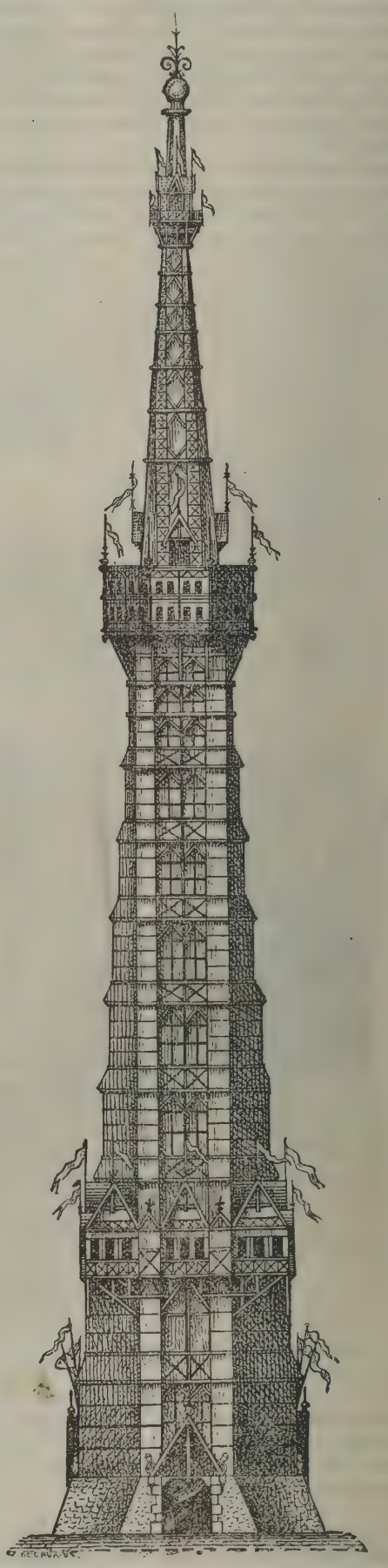
Fig. 1.

Fig. 1 shows how the elevator is made. The dimensions are as follows: A A A, 3 × 4 inch scantling; B B B B, 1 × 6 or 8 inch; C C, small wooden friction wheels to run against the side of building; D, inch flooring; E, screw hook; F F, sills, 2 × 4 or 6 inches.

A WOODEN TOWER NEARLY 1,000 FEET HIGH.

On the occasion of the great International Exhibition of Sciences and Industry at Brussels in 1888, it is proposed to erect a 300 meter (984 foot) wooden tower after designs by Messrs. Hennebique and Neve.

This tower, a general view of which is given in the annexed engraving, is to be 174 ft. square at the base. It will consist of a parallelopipedon supported by eight counterforts having a projection of 49 ft. and being 16 ft. in thickness. The calculations have been based upon the supposition that the tower will, through its inertia solely, resist an upset thrust produced by a wind exerting a pressure of about 65 pounds to the square foot. On giving the tower a total weight of 15,000 tons, with a base 174 ft. square, the moment of resistance to overturning would be much greater than the moment of overturning due to a wind such as above supposed.



WOODEN TOWER NEARLY 1,000 FEET HIGH.

The sections of the framework at each point of the height have been determined in the same way. The wood required would thus be 353,200 cubic feet.

Seven elevators in the interior will give access to the three stories, in which will be established restaurants, a belvedere, and an observatory. It will be possible to erect the tower in one year, and it will cost, at the most, $400,000. The authors of the project think that this sum can be easily raised by the formation of a society issuing stock at $2 per share, and giving the right to ascend the tower.—*Chronique Industrielle.*

GEORG EBERS.

Georg Ebers, the German Egyptologist, has just celebrated his fiftieth birthday; and as this point of a man's life is supposed to be the time of all others for reviewing his past, we, too, will take at least a hasty glance at the work of this scientist, novelist, and poet. He was born in Berlin, and went to school and college there and at Gottingen; but while still quite young he was obliged by illness to leave his home, and he went to Egypt. During this and a subsequent journey to the land of the Pharaohs he pursued the studies on which his books were afterward founded. His labors for the dissemination of knowledge of the history of the Nile country were not, however, confined to his writings, for he taught at the University of Jena, and afterward received a professorship at Leipzig.

Even a short sketch of the life of Georg Ebers would be incomplete without some reference to his charming family life and his delightful home on the banks of Starnberger Lake, in Bavaria, which is shown in the accompanying cut, taken from "Ueber Land und Mehr." Here he has written some of his best poems, and we trust that these congenial surroundings will continue to inspire him in the future as they have in the past.

THE COUNTRY RESIDENCE OF GEORG EBERS, STARNBERGER LAKE.

Nothing could be more charming than the scenery in the immediate vicinity of this comfortable little dwelling. The water view reminds one of our own "Thousand Isles" on the St. Lawrence.

Copper as a Roofing Material.

Some time ago we drew attention to the reduction in the price of copper, and to the advantages possessed by it in comparison with other roof coverings. Since our remarks appeared there has been a desire on the part of many to introduce the material for buildings. As a roofing material copper has pre-eminently those properties which render it particularly desirable. In the first place, it can be hammered and shaped to any form without injury. Resisting oxidation and acids, it is found to last much longer than other metallic coverings; it is more durable than lead as a material for bearing traffic, it is considerably lighter, and, on the whole far more pleasing in color. Perhaps its most important qualification is its comparative lightness for roofs. The same firm remarks that "it may be used advantageously at one-fifth the weight of lead—that is to say, a building which would require five or six tons of lead to keep it weather proof may be rendered equally secure and for as long a time with one ton of copper." Even if we say that copper of one-third or one-fourth the weight of lead can be used, a very important reason can be given for its preference. The saving of timber or iron in the roof framing is a consideration of great moment in very many instances.

If copper can be bought at less than half its former price, and can be used at considerably less weight per foot than lead, there is evidently great advantage in using it. We have good reason for stating that 16 oz. sheet copper can be supplied and laid at from 1s. 3d. to 1s. 6d. per foot superficial. For lead coverings the timbering must be of heavy scantlings compared with those required for copper. For traffic, the latter material is found to be far more able to stand the wear than either lead or zinc. The cost of laying copper is rather more than that of lead. Referring to Laxton's, 16 oz. sheet copper to flats and gutters, including seams, labor, ties, and nails per foot super., is 2s., and 20 oz. sheet for flats 2s. 6d.; but these prices are high, and tend to mislead. Comparing copper with zinc, the latter has the advantage in first cost, since zinc can be laid down as light as copper for one-half the price. But what of other matters? The two coverings cannot be compared as regards durability or appearance. We all know how zinc wears in most towns; how it gets eaten away by the action of the atmosphere, or rather by a voltaic action that is set up. We have known zinc roofs and flats that have had to be replaced in the course of seven or eight years. Copper will last at least four or five times that period uninjured. It may be stated generally that the cost of 16 oz. copper is about double that of 16 gauge (24¾ oz.) zinc. Of course copper, like zinc, should be laid without solder, and allowance made for expansion and contraction. The adaptability of copper for architectural purposes, especially roofs, mansards, domes, and lighter ornamental features, such as turrets, is one, we think, of its chief recommendations. In London the material, wherever it has been used, has worn well. The roof of the pumping station of the Main Drainage System, Grosvenor road, is covered with copper, and is a very good test of its durability in a very exposed situation. It has also been used to cover the cupolas of the new meat, fish, and vegetable markets at Smithfield; these features having the material applied in stamped patterns, the work having been executed by Messrs. Holden & Co. To the architect the value of using a covering for his ornamental features, that are generally inaccessible for ordinary repair, is of importance. In these cases, even if a little more expense is incurred at the commencement, the cost is quickly saved in repairs. The great toughness and malleability of copper enable the workman to bend it to all ordinary curves and angles, and to boss the work by hand. It can be even beaten into thin leaves. From these considerations we think that the profession would be consulting their best interests in availing themselves of copper for their ornamental roofs, or where durability and lightness are desirable qualities. Comparing the appearance of copper with zinc and lead, we think it will be at once admitted that the former possesses a more agreeable color for this climate, and that the rust or green coating it takes after a few years is by no means unpleasing. In France and, indeed, in this country, copper was much employed by the mediæval builders; but since the introduction of zinc, which is much cheaper, it has seldom been used. Now, however, the extremely low price of the material has called attention to its qualities, and it is destined once more to take its place as the best covering metal we possess.—*Building News.*

Waxing Floors.

Take a pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in three pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for, if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close-grained wood, and more if the wood is soft and open-grained. Even professional "waxers" are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continuing your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of any of the common "driers" sold by paint dealers, japan, for instance, in the proportion of one part of the drier to six parts of turpentine. When the floor is a large one, you may agreeably vary the tedious work of polishing by strapping a brush to each foot and skating over it.

THE fastest train in the world is said to be one between London and Bristol, England, which makes the distance (118¼ miles) in 120 minutes.

THE EDELWEISS.

(LEONTOPODIUM ALPINUM.)

If there is one plant more than another that is sought after by tourists on the Swiss Alps, whether they be plant lovers or not, it is the edelweiss, a singularly curious plant—so curious, in fact, that no one who once sees it is likely to mistake any other for it. It is the badge of tourists, although, as everybody knows, they often get their badges second hand, for to get to the haunts of the edelweiss is sometimes not an easy matter. There has been—indeed, still is—a good deal of nonsense written about the edelweiss. Some would lead us to believe that some deep secret is connected with its culture, and that it will not succeed except in the temperature of an ice-house. As a fact, it is one of the easiest plants to grow if not coddled. Where failure occurs most frequently is in the case of old plants that have been torn up carelessly and sent home, where they, perhaps, arrive half rotten; whereas, if people gathered the seeds and sent them instead of old plants, they would experience no trouble concerning culture, for home-raised seedlings are as easy to grow as those of any other hardy perennial. Even with us the edelweiss dislikes division, and rarely if ever does well after that operation. The best plan we find is to choose a rather sunny position for it, close to a bog or shallow swamp; give it a good depth of rich peaty soil, and prick out the seedlings as soon as ready to handle. Where the bottom is not cool, a little more shade will be required than where it is so, and if grown close to a wall, better success will be attained than elsewhere. The plan of raising plants from seed applies also to most other alpines. The edelweiss is very plentiful on the Himalayas, at 14,000 feet elevation, in Cashmere, Kurum Valley, and Southern Europe. With us it flowers in July and August.—*K.*

THE EDELWEISS (LEONTOPODIUM ALPINUM).

THE LARCH AS A LAWN TREE.

W. GOLDRING.

Mr. Marnock was not singular in his opinion when he said some time since that "the larch as an ornamental tree is much neglected." It is indeed a neglected tree in ornamental planting, even in parts of the country where it is not grown in plantations for timber. Perhaps it is because it is such a common plantation tree that it is ignored by planters, yet in the whole range of ornamental trees there is certainly none more beautiful than a vigorous young larch, particularly when seen in early spring, just as its tassels of new foliage unfold, accompanied, may be, by strings of tiny cones brightly colored and fragrant. The larch, like the

A YOUNG EUROPEAN LARCH.

deciduous cypress (Taxodium distichum), seems to burst out suddenly with the freshness of its young leafage, but the exquisitely graceful growth of the larch makes it the most beautiful tree of the only two deciduous conifers commonly cultivated. To be really beautiful as a lawn tree, a larch must be young, vigorous, and well cared for from its youth upward, and must always have plenty of room about it to develop itself fully; otherwise, it soon loses its branches, and then half its beauty is gone. An old plantation larch is not a lovely object, not even picturesque, as an old Scotch fir generally is; but, planted in good soil in a sheltered spot on a lawn, and perfectly isolated, a larch may be kept in perennial youth, so to speak, and produce a finer effect than half the modern conifers which crowd every garden. I remember seeing last year a grove of young larches on a lawn that greatly impressed me by their elegant growth. They were of different sizes, the tallest being about 30 feet, the shortest about 10 feet, and they were so grouped that the whole mass, numbering about a score, looked as if they were nature-sown seedlings, so informal, yet so effective, was the outline of their tops. The spot was sheltered by a plantation from the prevailing winds from the southwest, and the soil was good, so that the trees were in favorable circum-

CONING BRANCH OF LARCH AND WINTER TWIG.

stances. A grove of larches, including, besides the common, the American, Japanese, and others, should be planted in every good garden, on a lawn, or in the pleasure grounds.

PALMS FOR ROOM DECORATION.

(CHAMÆDOREAS.)

This genus consists of numerous dwarf growing plants, with, for the most part, slender stems and elegant pinnate or feather-like foliage. In a wild state they are always found growing in comparatively elevated situations under the larger forest trees as underwood, and but rarely in the open. Under cultivation they thrive best in an intermediate house, well shaded and liberally supplied with moisture, and many of them are admirably adapted for room decoration, as, just after the first year from seed, they become extremely ornamental, and their bright, smooth, green leaves are easily cleansed from dust. Even in comparatively small pots they continue to increase in beauty and stature annually. As a matter of course, they should not be allowed to stand close to the windows in severe weather, nor should they be subjected to cold draughts. If the foliage is occasionally sponged and the roots well supplied with moisture, in the form of tepid water, given at midday, few plants excel these chamædoreas as decorative objects, a fact fully recognized in Germany, where they are largely used in this manner. Many of them flower annually, and their long, branching inflorescence adds materially to the interest that attaches to them. As in most instances they perfect their seeds, a supply of young plants can be easily obtained at little expense, which is not the case with the majority of the palm family. Chamædoreas should be potted in a mixture of peat and loam, and liberally supplied with water. Indeed, failures with them are usually traceable to a meager supply of moisture. The first year's seedlings produce broad, simple leaves, deeply divided at the ends, but even in this state they are ornamental. In the second year they begin to develop pinnate leaves, which increase in length and breadth as they get older. In a few instances, however, this broad, deeply cleft leaf (bifid) is the normal condition of the species of which C. geonomæformis affords an excellent example. The Chamædoreas are all natives of America, and the following kinds are among those which we have found to thrive best as indoor plants, viz.: C. graminifolia. This is a slender, grass leaved kind, as its name implies, and it is one of the most elegant of the family. Its leaves are plume-like, dark glaucous green, and when fully developed attain a length of a yard or more. Its branching inflorescence is pendulous, and about a foot long. C. elegans has a more robust stem than graminifolia, and the foliage, which is gracefully arched, grows from three feet to four feet long in fully developed specimens, while the leaflets are some six inches long and about one inch broad, tapering at either end, and bright green. C. sartori resembles elegans, but the leaflets are broader, and do not taper so much toward the base. It has a very hardy constitution, and is one of the best for the purposes indicated. C. arenbergiana is also a very beautiful kind. Its bright, green leaflets are pendent, and taper to a tail-like point. C. wendlandi is another beautiful species, and, perhaps, the most useful of all for room decoration. Its bold, arching green leaves are about a yard long, while the leaflets are some twelve inches in length and two inches in breadth. C. glaucifolia is a slender stemmed kind, with long, arching, feather-like leaves, having a milky glaucous hue on both surfaces. C. geonomæformis attains a height of about four feet, and bears simple, deeply cleft or bifid, strongly ribbed, deep green leaves, which are some nine inches or more in length, and from four inches to six inches in breadth. Its graceful pendent flower spikes add much to the general effect, although the flowers are of the same hue as the leaves. C. ernesti-augusti is also a bifid leaved species, which attains, when fully grown, a height of five feet or six feet. Its stem is about two inches in diameter, and conspicuously ringed by the scars of the fallen leaves. These are broadly sheathing and stem clasping at the base, from one foot to two feet long, cleft for about half their length, serrated at the edges, conspicuously ribbed, and dark green in color. When in flower this little palm is especially ornamental. The male and female flowers are produced on separate plants. In the former the spadix is branched, the numerous long, slender branches being densely clothed with little round orange scarlet flowers. The female plant produces a single (or more rarely a double) thick, fleshy

CHAMÆDOREA GEONOMÆFORMIS.

green spadix, studded with numerous bead-like, coral red flowers.—*W. H. G.*

For the foregoing engravings and descriptions thereof we are indebted to *The Garden*.

A NEW pocket camera has been invented. It is inclosed in an ordinary silver watch case, and is said to do very good work by the dry-plate process.

A HUNGARIAN VILLA.

We give a sketch of a country house or villa lately erected in Loebau by Theobald Hofmann, architect, Budapest, Hungary. Our engraving is from *Architektonische Rundschau.*

Cathedral of Notre Dame, Paris.

The cathedral of Notre Dame, Paris, was built about 1177; its length is 414 feet, height 102 feet, and width 144 feet, without accounting for the space allowed to the forty-five minor chapels; it is built in the Gothic style of architecture, in the shape of a crucifix; it has two large square towers that impart an aspect of stateliness to the fabric. The four lofty windows of stained glass are elaborate; the sanctuary and high altar are of marble. On the front are three doors ornamented with antique sculpture; a gallery, supported by small columns, extends from one extremity of the building to the other. The two square towers, above the lateral doors, are each 204 feet high; a staircase, containing 389 steps, leads to their summit. From the towers a splendid view of Paris and its suburbs can be obtained. Victor Hugo laid the tragic fate of the Goblin Monk, in his romance of "Esmeralda," to occur from one of these lofty pinnacles, denominated the South Tower, in which there hangs a bell similar to Big Ben, termed "Bourdon;" it weighs 2,000 lb.; it is 8 feet in diameter, 8 feet high, 8 inches thick, and the clapper weighs 976 lb. The edifice is decorated with pyramids, figures, and obelisks. The roof is covered with lead. Three exterior galleries surround the building; the first, higher than the chapel; the second, above the choir and nave; the third, about the great roof, furnishes a passage. One hundred pillars support the interior vaults; the nave and choir are bordered by a couple of double aisles. Above the vaults of the aisles are spacious galleries, from which all the religious ceremonies are seen. The interior is also lighted by 113 window and three rose lights. The entry to the choir is adorned by two estrades of Italian marble and a handsome grate, raised 5 feet above the pavement. The grate contains four square panes, two of which are fixed; these are surmounted by eight bronze spears, finely worked and tipped with gold; the panes are of Tuscan design, on a blue enameled surface of stars at each angle. The six arches of the sanctuary have handsome grates, crowned with Etruscan frieze; they were constructed of steel after the designs of Fontaine and Percier. In the choir are a pair of pulpits, a double row of stalls, crowned by a carved wainscot, representing the circumstances in the history of St. Mary. To the right are bass-reliefs, executed by De Goulon, Taupin, Goupel, and Bellau. The two pulpits are enriched with bass-reliefs showing the martyrdom of St. Denis, the cure of Childebert I. by St. Germain, Bishop of Paris, from sketches by Masse. Eight paintings depict in the upper section of the choir actions in the life of the Virgin Mary. To ascend the sanctuary are four steps of Languedorian marble, with balustrades of fine Egyptian marble, adorned with two chandeliers, each 7 feet high, the lower portion of green marble, richly gilt. The pillars are of Serancolian marble; the main altar is 12 feet 10 inches in height.

A HUNGARIAN VILLA.

AN excellent home made axle grease is said to be made of two parts tallow, two parts castor oil, and one part of pulverized black lead.

Cast Iron Beams under Repeated Impacts.

The effect of impact and vibration upon structures was a leading object of inquiry with the Commission on the Application of Iron, and the first series of experiments instituted upon this subject was to determine the power of beams to sustain impacts many times repeated. For this purpose sixteen bars were cast, all from Blaenavon iron, No. 2, and five at least of the sixteen were found to be slightly defective at some place where they gave way. Whether these small defects were more numerous than would be found in practice, it would be difficult to determine. Six of the bars were each 15 ft. long and 3 in. square, and placed on supports 13 ft. 6 in. asunder; seven were each 10 ft. long and 2 in. square, and 9 ft. between the supports; and three were each 5 ft. long. 1 in. square, and 4½ ft. between the supports. Of these bars, six were bent through one-third of their ultimate deflection at each blow, and five of them bore each 4,000 blows without breaking. The sixth was broken at a flaw with 1,085 blows.

One large bar, bent by impact through five-twelfths of its ultimate deflection, was broken at a defective place with 1,350 blows. Of six bars bent by blows through half their ultimate deflection, five were broken with less than 4,000 blows each; one with 29; one with 127, etc. The only bar which bore the 4,000 blows was one of the smallest kind, or 1 in. square. Of three bars, one bent to seven-twelfths, and two to two-thirds the ultimate deflection, all were broken, the two latter with 127 and 474 blows respectively. The former required 3,700 blows to break it.

Of ten bars of Low Moor iron, No. 2, each 10 ft. long and 2 in. square, placed on supports 9 ft. asunder, and struck in the middle with long continued impact, as before, four broke at defective places and two at sound ones. Three were subjected to impacts bending them through one-third of their ultimate deflections, and bore the test without fracture; of three bent by blows through half their ultimate deflection, two were broken; those bent through two-thirds were all broken. On the whole, it appears that no bar but one, and that a small one, stood 4,000 blows, each bending it through half its ultimate deflection; but all the bars when sound stood that number of blows, each bending them through one-third of their ultimate deflection. It must, however, be borne in mind that a cast iron bar will be bent to one-third of its ultimate deflection with less than one-third of its breaking weight laid on gradually, and one-sixth of the breaking weight laid on at once would produce the same effect, if the weight of the bar was very small compared with the weight laid on it. Hence the prudence of always making beams capable of bearing more than six times the greatest weight which will be laid upon them.—*E. Hodgkinson.*

Cheap Steel Girders.

As an indication of the way in which steel is supplanting iron for structural purposes, it is announced that a leading Middlesbrough firm, Messrs. Dorman, Long & Co., who have attempted to compete with Belgian makers of rolled iron girders and joists, have determined to practically abandon this branch of manufacture, and to roll only steel girders and joists. It is reported that this decision has been made in consequence of the persistence of the Belgian makers in underselling their English rivals, whereby the market is choked with iron girders and joists of very inferior quality, but offered at a price that suits builders and others to whom iron is iron, so long as it is the required size and is painted red. Messrs. Dorman & Co. have, however, started new works for the manufacture of Siemens-Martin steel, which are calculated for an output, when in full operation, of more than 1,200 tons per week. It is intended to turn out all dimensions and sections of girders and joists, which will carry loads of forty per cent. more than corresponding sections of iron, while the increase in price will only be twenty-five per cent. To show how cheap sections of steel suitable for gas holder and roof work can be made, it may be stated that steel joists up to ten inches deep are quoted at £6; joists twelve inches deep are quoted £6 5s.; and fourteen inch joists £6 10s. at Middlesbrough. The largest sections made at these works will for the present be 15 in. by 5 in. by 5 in. to 20 in. by 8 in. by 8 in. Engineers specifying these steel girders will at least have the satisfaction of knowing what they are getting.

A Good Floor.

A good floor should be—
A test of the builder's skill;
Of thoroughly seasoned lumber;
Without creaking boards;
Without splintering edges;
Without gaping joints;
Without curling section;
Flat as a table top;
Rigid and smooth;
Almost imperceptibly jointed;
Undisturbed when laid;
Laid on straight-edged joists;
Without heading joints;
Laid without showing nails;
Of edge-nailed boards;
Laid on a bed floor.

A good floor is a rarity.

THE METROPOLITAN MUSEUM ADDITION, CENTRAL PARK, NEW YORK.

Under the direction of the present board of trustees of the Metropolitan Museum of Art, not long ago, an appropriation of $350,000 was made to add to the building. Mr. Theodore Weston, one of the trustees, was engaged as the architect, and with his partner, Mr. Tuckerman, prepared plans for the structure.

The addition, in connection with the old building, forms a hollow square, the center being an open court across which runs a bridge connecting the two portions of the building.

The intention and aim of Messrs. Weston & Tuckerman has been to provide a building which would be architecturally an ornament to the city and at the same time keep the main idea of the ultimate object of the structure evident.

The treatment is simple and classic, in the modern French school, suggesting the Prix de Rome contests in the Ecole de Beaux Arts, which are famiiiar to all students of architecture.

The approach to the main facade, which fronts toward the south, passes over a terrace 100 feet in depth, and extending the whole front of the curtain, winding away toward the main driveway in front of the two wings. Directly in front of the portal is the covered driveway leading under the terrace to the administrative departments in the basement. From the terrace is the entrance to the building, which has a frontage toward the south of 233 feet. The front is divided into two pavilions and a curtain.

From the base course of granite rise three round, arched openings, the two end ones serving as windows, the center being the entrance portal. The impost moulding running as a string course through the entire length of the building, and returning on the sides, breaks these openings, the upper part of which is filled between the triple mullions with a rich bronze grille. As is the case with all the openings in the face of the building, the reveals are very deep, and consequently cast extremely heavy shadows, giving a richness, tone, and general effect of solidity. In the spandrels between the center and end arches are two bronze portrait medallions in circular granite frames, one of Michael Angelo and the other of Raphael. The double billet moulding running around the inside of the frame is very rich, and gives the bronze a striking effect in conjunction with the selected brick which fills up the remaining space in the spandrels.

The window openings and the transom over the entrance are triple mullioned. The effect of the deep reveal of the arches in these openings has been still further heightened by this arrangement of the mullions, causing almost the entire upper portion of the opening to be thrown into deep shadow. The entrance itself is strictly classic in outline and treatment, and with the bronze door executed in heavy relief, and the bronze grilles, both in the door itself and the windows on either side, give strong effect. In the windows in the side wings the reveals are four feet deep. The heavy lintel is supported by a compound mullion, the main feature of which is a detached column of polished black granite. Behind this comes a pilaster of tooled granite. There are three of these windows in the front of each wing. Above the impost moulding running just over the lintels of these windows the space is divided into three recessed panels, in the upper part of which are set three frieze reliefs in Indiana limestone.

In all there will be eleven new galleries added to the museum.

The partitions throughout the building will be of peculiar construction. Instead of studs, a skeleton iron framing will be used, filled in with plaster of Paris and sheathed on both sides with one and one quarter inch spruce, and covered outside of the sheathing with tightly stretched cloth. The object of this arrangement is to present a uniform wall surface upon which pictures may be hung at any point without having to search about for a convenient beam or piece of studding in which to firmly fix a nail or screw.

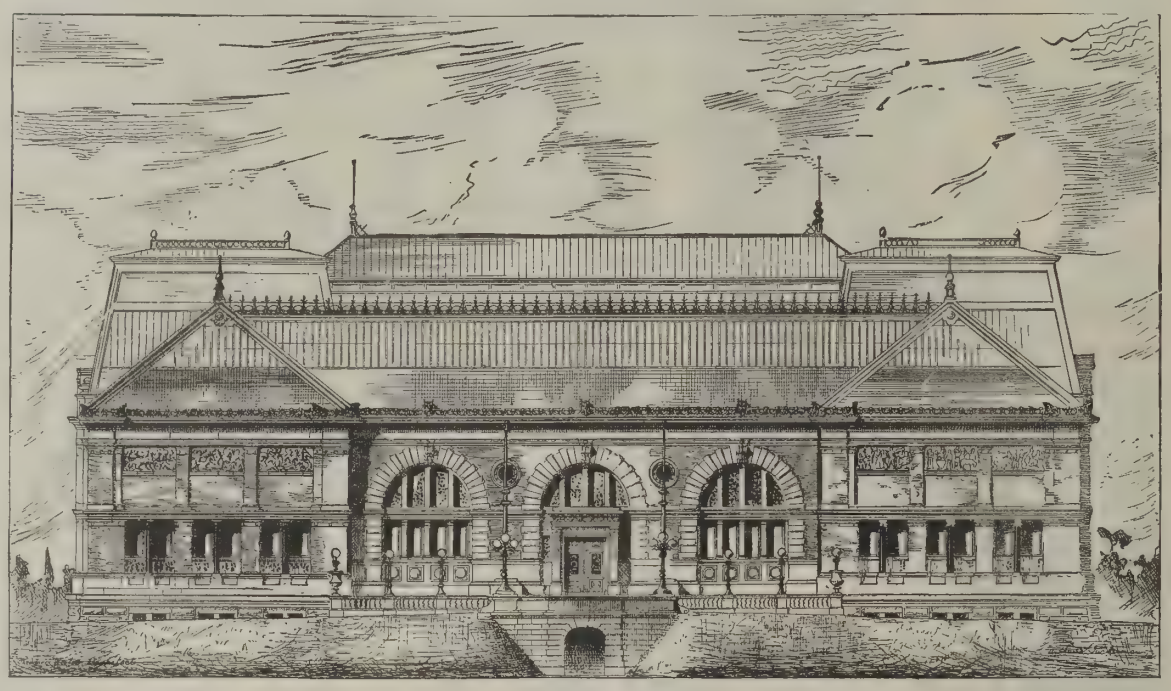
The galleries are to be lighted by double skylights. The outer roof is glazed over the iron trusses half way down to the gutters, and beneath this glass and iron roof are other skylights, more ornamental in construction, forming the ceiling to the rooms. This arrangement admits of the inside lights being opened at any time of the year without danger from the weather, and at the same time distributing the light in a very good manner.

The building is strictly fireproof, that is, as strictly fireproof as it is possible to make any building, for no matter how it is constructed, its interior arrangements demand the use of materials that fire will burn. The floors are supported upon iron girders, filled between the spaces with beton cement arches. The surfaces of the floors are housed to correspond with those in the old building. The inner rooms and galleries in the addition, and in that portion of the old building fronting upon the court which is faced with imported glazed white brick, receive by reflected light plenty of illumination. For illumination at night a full electric and gas plant will be provided. The whole arrangement of the building is complete. The necessities and exigencies of a building of this kind have been carefully weighed by Messrs. Weston & Tuckerman, and the result should be highly gratifying to them. The treatment is in good, wholesome architectural taste.

For the foregoing particulars and for our illustration we are indebted to the *Art Age*.

In addition to the rich store of art treasures now within the walls of the Metropolitan Museum, it is pleasing to be able to add that one of the principal galleries of this new building is to be specially graced by a magnificent private collection of paintings, the generous legacy of a wealthy lady of New York. "The Catherine Lorillard Wolfe Collection," for so it is to be known and styled, consists of a large number of celebrated works of art, valued in all at half a million dollars.

The collection is a remarkably even one, showing scarcely a single indifferent piece, the examples of each painter being quite up to his best level. Many of the famous modern painters are represented. Meissonier has two large canvases, "The Two Vanderveers" and "A General and his Adjutants," and one water color, "The Sign Painter." Jules Breton is represented by his big "Pardon in Brittany," a peasant church procession. Rosa Bonheur has a Scotch landscape with cattle in it, and her well known picture of a hound. Troyon has a Dutch landscape, with cattle also. L Bonnat is represented by "The Egyptian Fellah Woman and a Roman Girl on the Campagna." Cabanel painted a full face and three-quarter length portrait of Miss Wolfe for the collection, and a symbolic "Bride of the Church." "The Christian Martyr" is Gabriel Max's, and "The Ford," Fromentin's. Among the others are Bouguereau's "A Girl and a Child," Bangs' "Arabs in a Turkish Café," Piloty's "Wise and Foolish Virgins," Alfred Stevens' "The Japanese Toilet" and "Preparing for the Promenade," Detaille's "The Freebooters in the Woods," Gerome's "The Arabs at Prayer in a Mosque at Cairo" and "An African Chief," Vibert's "The Reprimand" and "The Startling Confession," Bellecour's "The Betrothal," Hans Makart's "After the Ball," Munkacsy's "The Mont de Piete," and Domingo's "A Spanish Interior." Knaus' "Holy Family" is, perhaps, the best known piece in the collection. Knaus had painted the picture on a commission from the Empress of Russia some thirteen or fourteen years ago, and Miss Wolfe saw it in Berlin before it was finished. The Empress would not take it afterward, and Knaus put it aside, declaring that he would never sell it. Miss Wolfe finally got it at a cost of more than $30,000. Among the other painters represented in it are Edward and Theodore Frere, Henner, Jules Dupre, Diaz, J. W. Preyer, Brion, Merle, Chaplain Chevet, Madrazo, Worms, Gallait, Wehrbach, Daubigny, Volon, Andreas and Oswald Achenbach, Verboeckhoven, Riefsthal, Rousseau, and Hamon.



THE NEW ADDITION TO THE METROPOLITAN MUSEUM OF ART, CENTRAL PARK NEW YORK.—. WESTON & TUCKERMAN, ARCHITECTS.

EXPOSITION OF FINE ARTS AT VENICE.

No place could possibly be found better adapted for an exposition of the fine arts than Venice. It would seem almost that paintings and statues must have been especially made to be placed in that city of palaces. The Italians, be it to their honor, are endeavoring to mend the chain of their glorious past, which has been so long broken. After Milan, Turin, Rome, have done so much, this city of the Doges is now trying to inspire a little life into the arts which formerly were held in such high esteem.

The exposition which will soon be opened at Venice will be held in a palace of a Greek style architecturally, near the Public Gardens, and occupying a plat of land of about 8,000 square feet. It contains forty rooms. It may be reached either by land, by the street San Francesco, where one of the principal entrances is placed, or by gondola or launch on the canal, where the other principal entrance is placed.

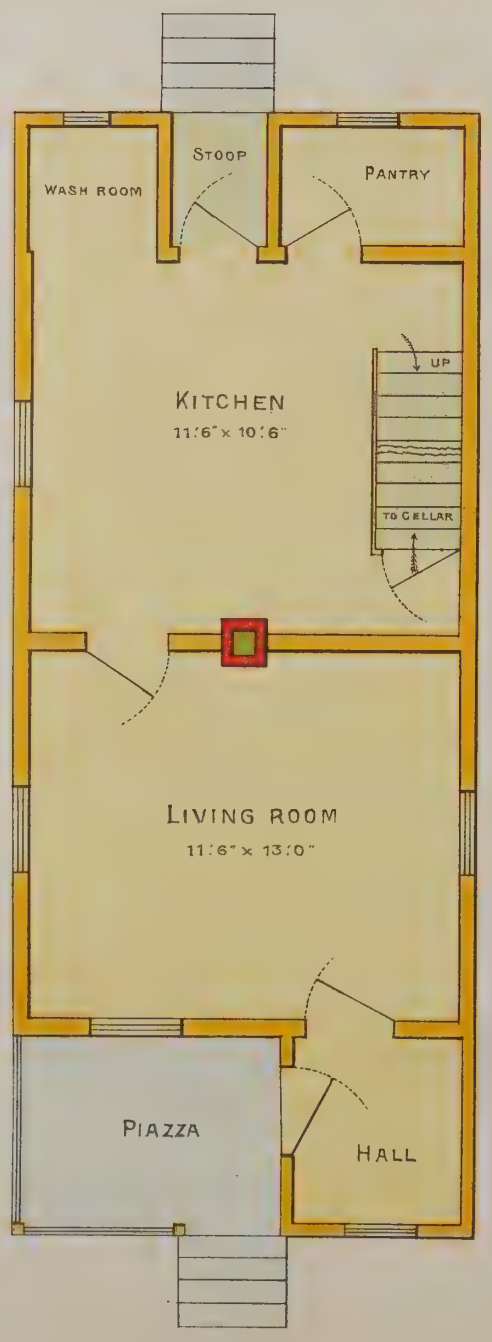
The general view of the exposition, which we publish herewith, shows what a magnificent scene will be offered to those who approach the palace by water. Those who are wearied with the promenade through the galleries may rest and regale themselves at the Cafe du Belvedere, which has been built especially for the exposition, but which will be kept after the exposition has been closed. From the terrace of the cafe one may enjoy the beautiful view of the canal, the tide, and sea.—*L'Illustration.*

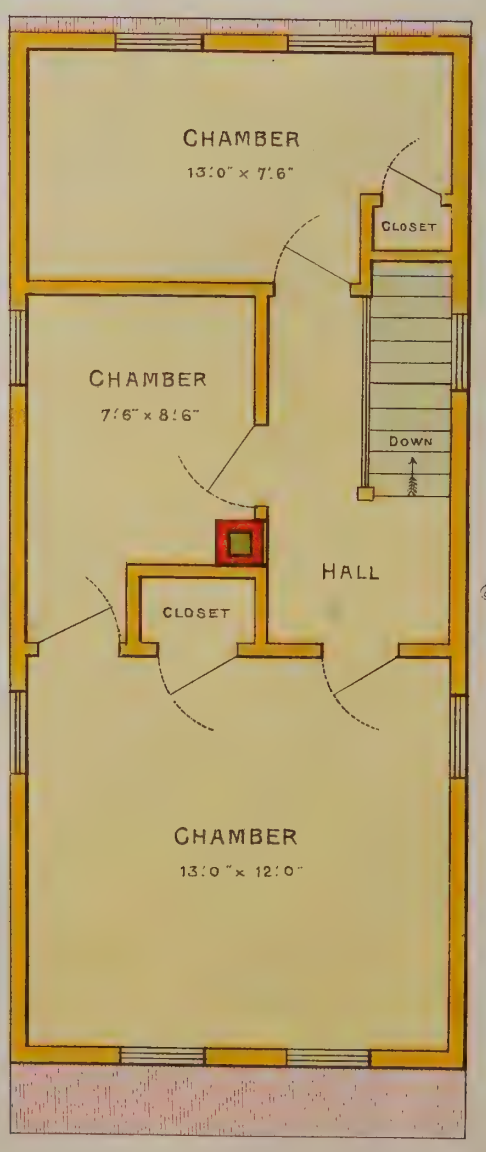
Root Choking of Drains.

Deep as drainage may be laid, it is never altogether free from the possibility of being put out of order by the roots of trees or of certain kinds of crops, which may penetrate the drains, and form a hindrance to the free passage of the water through them. The roots of the elm, ash, willow, and other trees are known to enter the pipes, and even pass through the ground for several yards to reach them, as if they were attracted by the moisture and air which they find in the pipes, and by the nourishment afforded them there. To obviate this difficulty, it is advisable, where it occurs or is apprehended, to use socket pipes jointed with cement, or to lay the pipes as far as possible from the trees. I have found that embedding the pipes in lime, mortar, or concrete has prevented them from being choked, although close to trees which it was impossible to avoid, and has kept them clear for some years. The roots of some crops, if they should penetrate the pipes, die away when the crops are removed, and are frequently washed out at the mouths of the drains by the strong flow of water through them. Other substances give the drainer a vast amount of trouble in obstructing pipes. Ocherous water, depositing oxide of iron, is a common source of obstruction. It appears to harden and consolidate as it receives air through the pipes, and ultimately chokes them. I have found it best to get at the source of the spring or springs, and conduct the water away by large pipes independent of the general system. Confervæ and parasitic plants will also get into the pipes, grow, and ultimately stop the flow of water through them. Another source of trouble is the percolation of sand into the pipes, which necessitates patience and care in taking them up frequently after being first laid, and relaid, until all the water has run out of the bed, and then laying them in straw and on strips of wood. P.

A Twelve Hundred Dollar Cottage

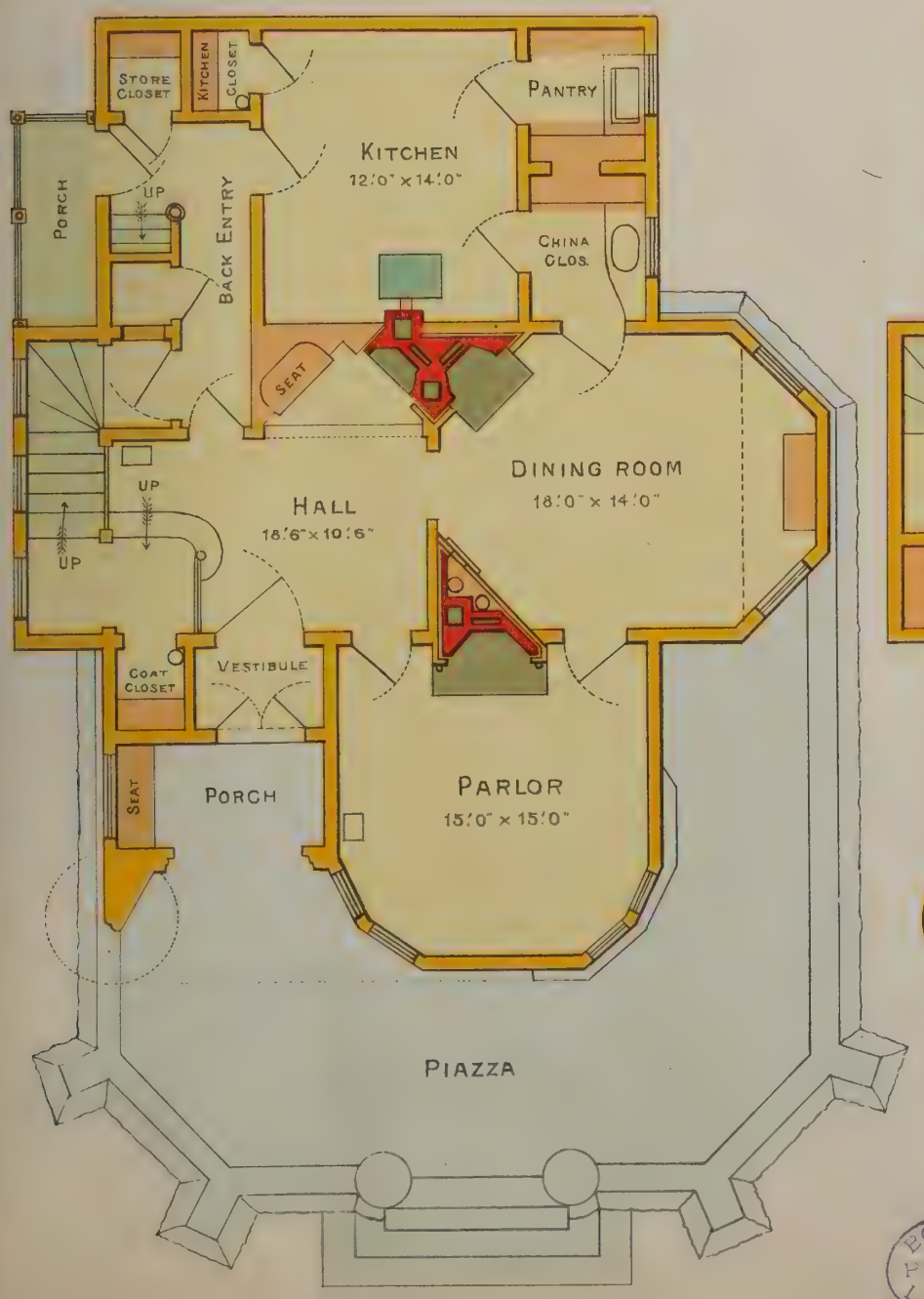
Plan of First Floor.



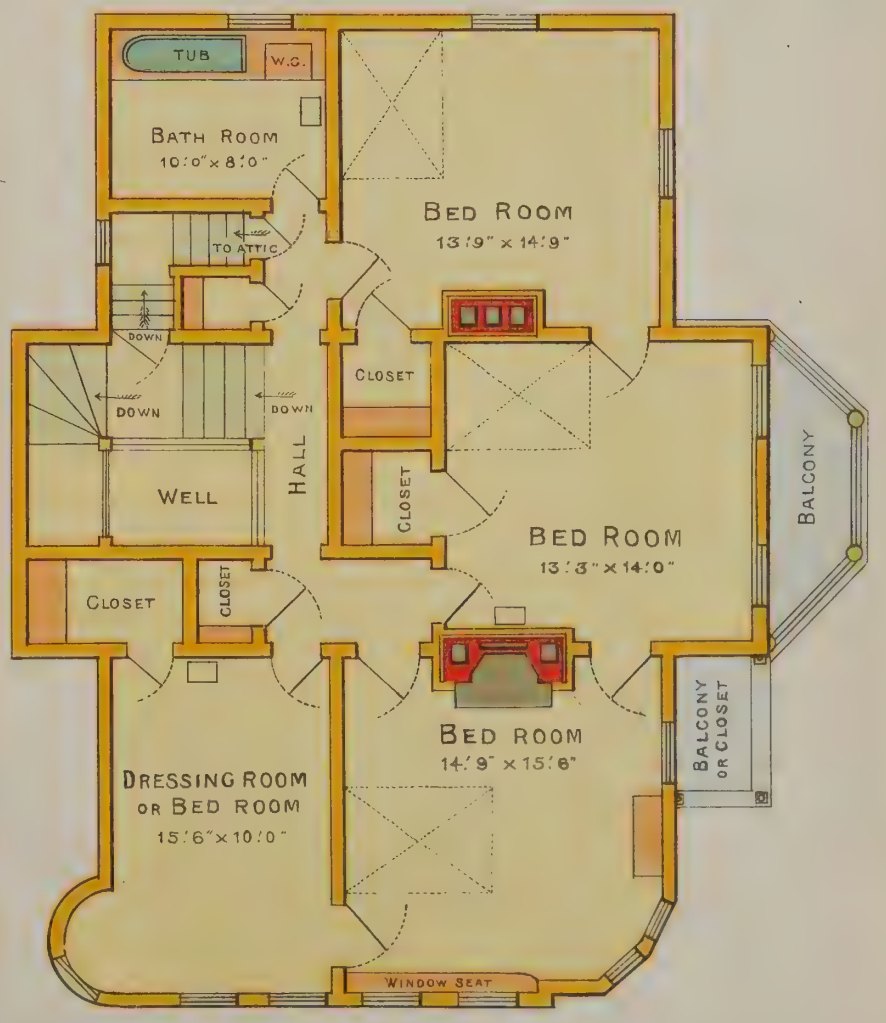


Plan of Second Floor.

· A · Residence · Costing · Five · Thousand · Dollars ·



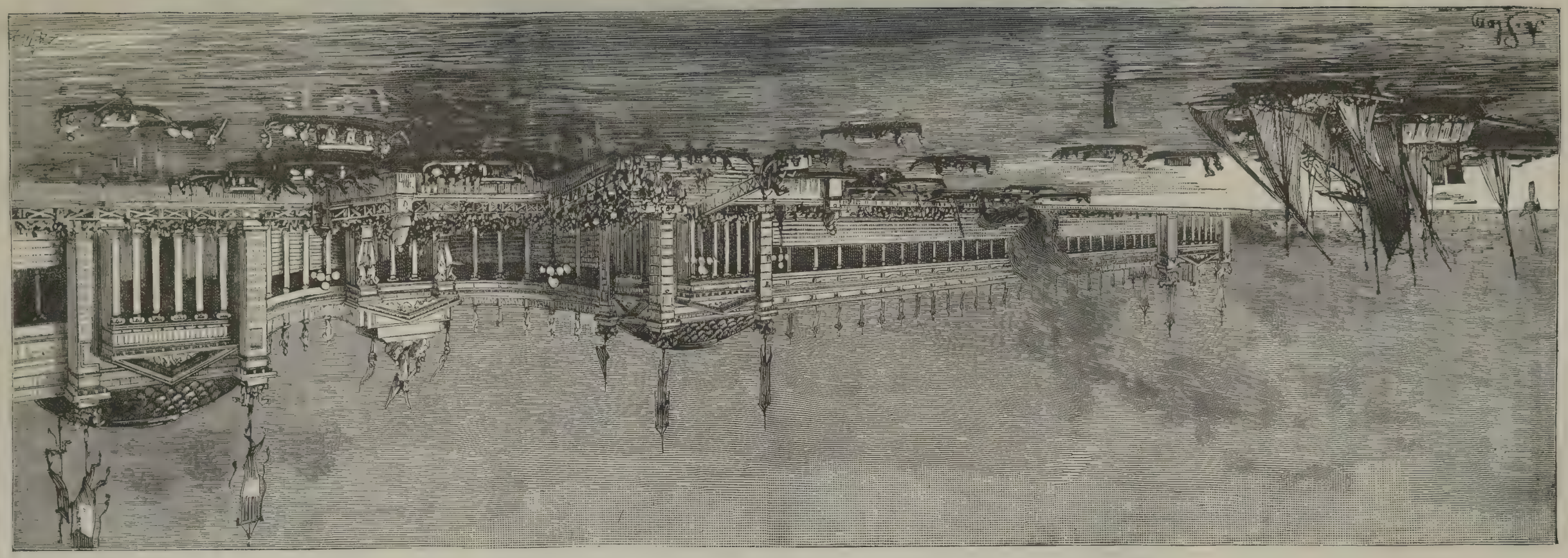
Plan of First Floor.



Plan of Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK.

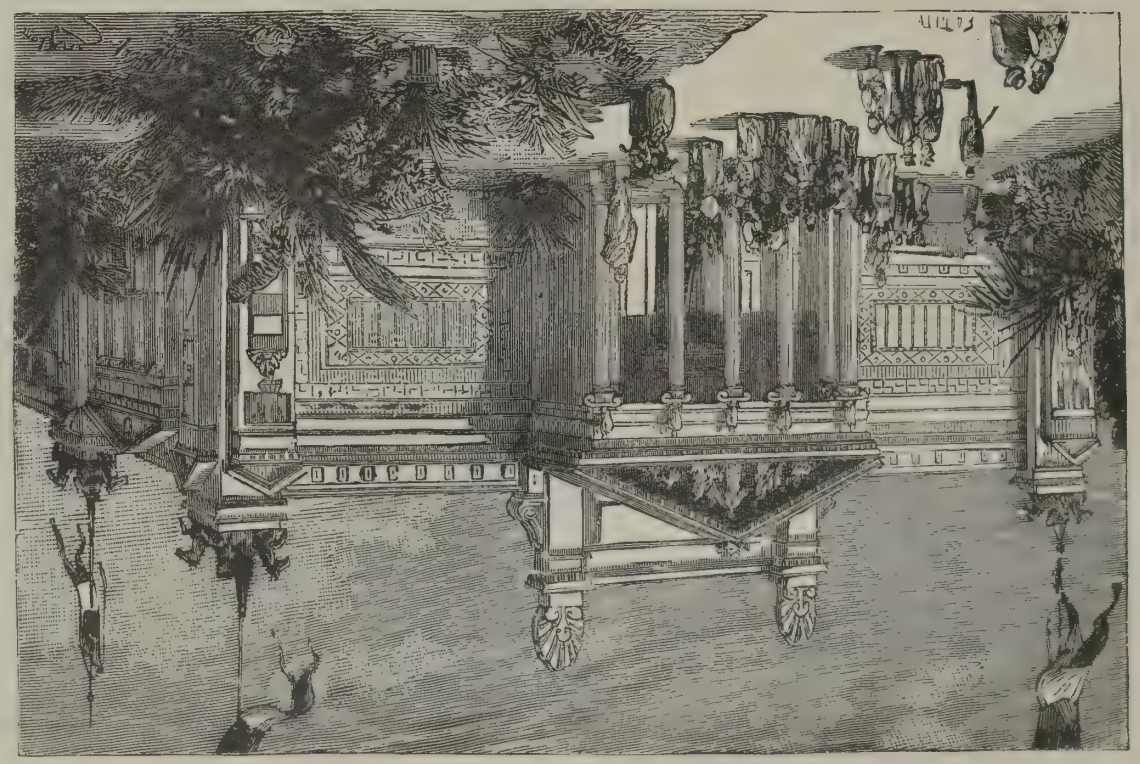
EXHIBITION OF FINE ARTS, VENICE.

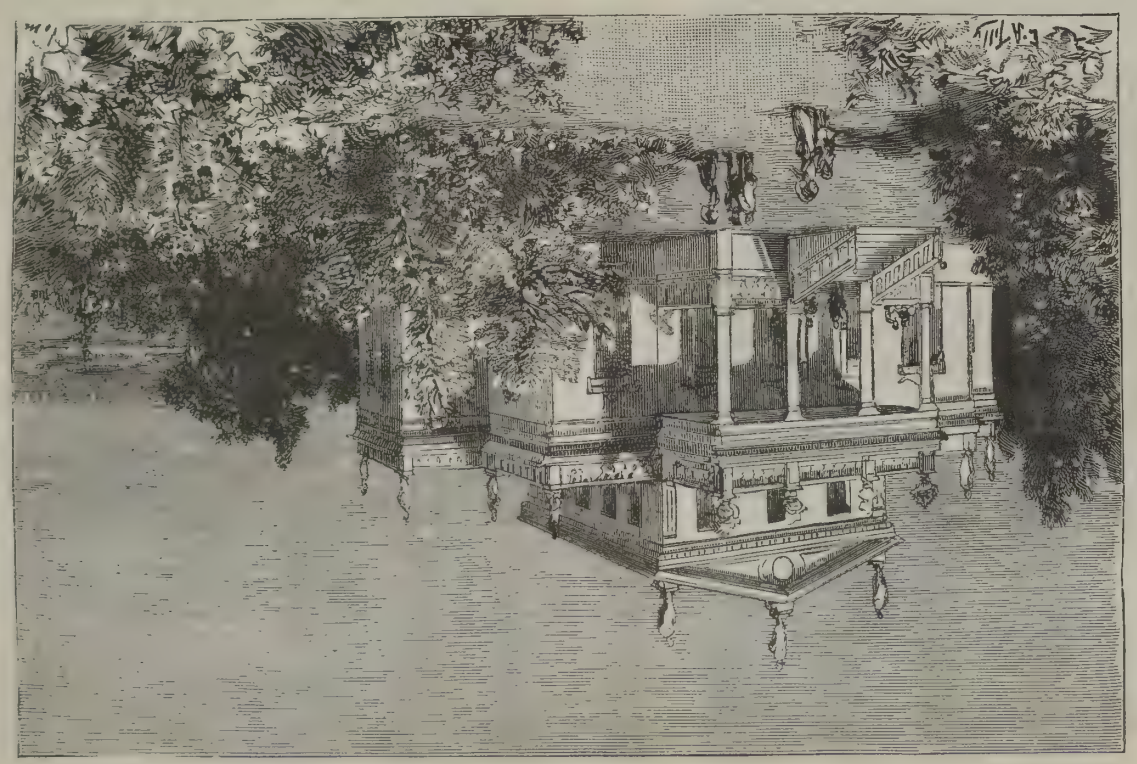


Entrance from San Francesco Street.

Principal Front of the Exhibition Palace.

Cafe of Belvedere.





WOOTTON.

The residence of Mr. Geo. W. Childs is situated about two miles from Bryn Mawr, a station on the Pennsylvania railroad, and ten miles from Philadelphia. It was at this beautiful place that Mr. Childs so elaborately entertained about 800 of the florists and their friends on the 20th of August last, during the convention of the National society; and as only a small proportion of the florists of America were present on that occasion, it may interest many of our craft to know something of this country seat.

Wootton, as it is now called, was at the time Mr. Childs bought it, in 1880, but a rough farm of about 116 acres. This has been converted into park and garden, with a lawn of thirty-five acres in most perfect keeping, and one of the finest "Queen Anne" country houses to be found in America.

Entering at the lodge, one sees on the left a fine carpet bed containing about 25,000 plants, a very striking feature. Leaving this by a gentle curve in the carriage drive we come to the stables and coach houses, fitted up with all modern improvements, almost in front of which is a fine plant of Abies nobilis, sent as a cutting to Mr. C. by Professor Meehan when with the Hayden exploring expedition in the Rocky mountains. At the rear of the stables, and placed as a facing to a fine grove of natural timber, are some large clumps of miscellaneous plants, very interesting to many visitors, as they contain many things not often seen in this present rage for carpet and other formal styles of bedding. In front of these is a fine stream of running water, which is a great attraction to the whole, and planted on one of the natural curves are some handsome clumps of arundo, rivina, and eulalia. Immediately in the rear of these again is a bed of fancy caladiums, which seemed to luxuriate in the partial shade, and made a happy blending between the natural woods and the dressed lawn in front. Passing on up through this glen we come to a grotto of rocks, through which a small waterfall trickles, and in which it is intended to collect every known variety of fern to be found hardy in North America, all of which will be correctly named. Passing on south from this we strike the open lawn, directly facing the house. Here are dotted among lots of choice trees and shrubbery some fine plants of Picea pungens, retinosporas, Taxus canadensis, pinus in variety, etc., which, for the short time they have been planted, are remarkably thrifty trees. These, as well as other similar classes, are very effectively arranged for future development.

In front of the house stands the magnificent vase illustrated and described in the *Florist* of Nov. 1, and above this, on each side of the steps leading to the front door, stand two grand plants of Cycas revoluta and a fine one of Araucaria bidwilli. In close proximity stands a purple beech planted by Madame Nilsson. On the west side of the house is an effective design planted with coleus and other summer plants.

On the gentle slope northwest of the house are situated most of the memorial trees planted by illustrious visitors to Wootton. These are all to be labeled with botanic names, circumstances of planting, etc., thus giving the collection a sentimental as well as scientific interest for the future visitor. Noticeable among them is a fine piece of Picea nordmanniana planted by Mrs. Nellie Grant Sartoris, and in close companionship a fellow tree and a Quercus palustris and Norway spruce planted by the three daughters of the late F. A. Drexel, all growing into nice trees; but those near by, planted by Thos. Hughes and Herbert Spencer, are both dead, which is much to be regretted. There are on this broad expanse of lawn many other trees planted by men of mark, but their enumeration would take too much space. There is one other, however, which probably would interest all who behold it. Standing close to the lower or farm entrance is probably the finest specimen in the country of Carya porcina (common hickory); stretching away from this is a fine avenue of platanus leading to the farm, dairy, and green houses.

The greenhouses are a fine combination of houses built to suit the various classes of plants required for a well-appointed gentleman's garden, and their contents show the skill of its able superintendent, Mr. John M. Hughes, as do all other parts of this fine place. Among the many other choice attractions of the greenhouse, a fine bench of gloxinias was particularly striking.

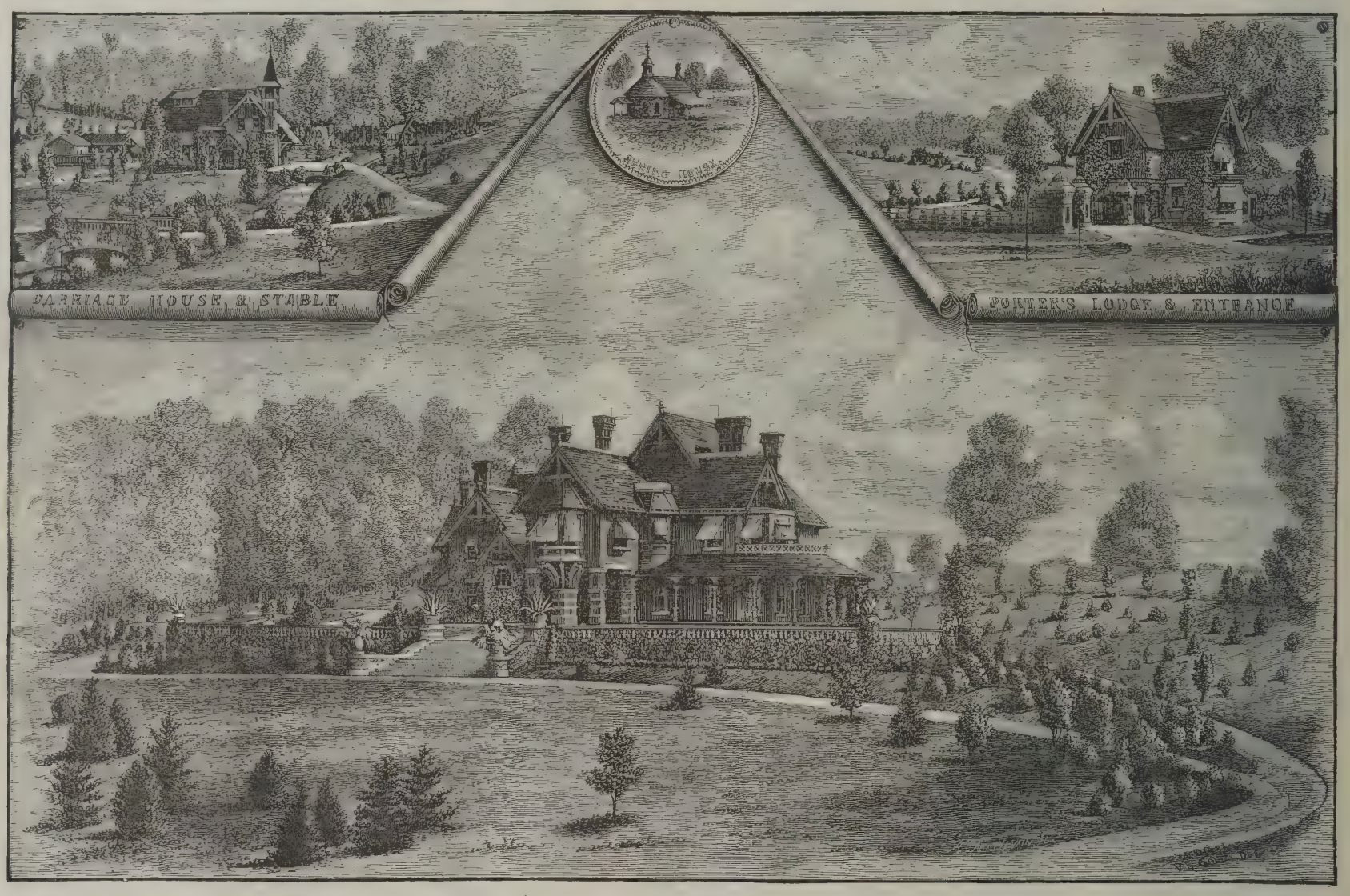
Running at the bottom of the vegetable garden is another fine stream of water, from which is pumped (itself furnishing the power) all the water required for the farm and greenhouses. In the same locality is the dairy, supplied with a constant stream of pure water from a natural spring flowing into a shell presented to Mr. Childs by the late General Grant, and brought by him from Yokohama, Japan. From this shell the water flows gently over beautiful clear white tiling all around the dairy, thus forming a cooler for the milk. Everything is in the most perfect order, and the whole building is unique in every way.

After taking a comprehensive view of this fine place, one is greatly impressed with the splendid results accomplished in the short space of six years. Not only lavish expenditure, but the most refined taste, were requisite for this end, and I only wish that many others with wealth at their command might be induced to become as liberal patrons of horticulture, for by such is our calling elevated and refined. Here the gardener is not treated as a necessary evil, as is often the case, but as a friend and trusted steward, employer and employed mutually considering each other's best interest and happiness.

The accompanying engraving beautifully illustrates the house and part of the lawn near to it, with the fine grove of natural timber in the distance, whose beautiful shade protected the florists and their friends while enjoying the lunch provided by Mr. Childs on the occasion of their visit. But this picture of Wootton, though excellent, does not give a true impression of the harmonious blending of art and nature which is so striking to all visitors. It must be seen to be appreciated.

John N. May.

Summit, N. J. —*Amer. Florist.*



"WOOTTON,"
DELAWARE COUNTY, PENNSYLVANIA.
RESIDENCE OF GEORGE W. CHILDS, Esq.

From Ashmead's History of Delaware County, 1884.

To Transfer Prints to Wood.

The whitewood used being perfectly smooth, should receive a few coats of French polish. The print to be transferred having been dampened with a sponge soaked in spirits of wine, is placed on the wood with a piece of thick cloth over it. A warm iron is then passed gently over the cloth, care being taken not to shift the picture. Keep the iron rubbing backward and forward for ten or fifteen minutes, then take off your cloth and leave it for some hours. Now get some cold water, dampen your finger in it, and rub the paper. Great care must be taken not to disturb the impression. Keep damping your finger as you go on. When you have got the paper all off, you can polish over. Any kind of print will do which is not glazed. Ink impressions are the most easily transferred.

Tree Growth.

The following figures may interest those of your readers who have paid attention to the growth of trees. I have carefully measured these seven trees annually, and give you the sum of ten years' growth.

	Jan., 1878.		Jan., 1887.	
	ft.	in.	ft.	in.
A sycamore	7	½	7	7½
A cut leaved alder	8	6	9	1½
An oak	10	0	10	7½
A Cryptomeria japonica	2	3¾	4	2
A Spanish chestnut that has been pollarded	13	10	15	5
The above trees are in the garden, the two following in the park:				
A Spanish chestnut	12	7	13	7
Another	8	8	9	5

It will be seen that the Spanish chestnuts grow faster than the other trees, and the pollard the fastest of all. The trees are measured at four feet from the ground.—*Wm. Wickham, Binsted-Wyck, Alton, in the Garden.*

CHURCHES OF MODERATE COST.

We present herewith a couple of sketches of churches of moderate cost, for which we are indebted to our esteemed cotemporary, *Building*. The cost of erection is stated in connection with the engravings.

National Association of Builders of the United States.

The first convention of this important body was held at Chicago, March 29, 1887. A full report of the proceedings was given in the March number of the *Building Budget*. The following is the

DECLARATION OF PRINCIPLES.

1. This association affirms that absolute personal independence of the individual to work or not to work, to employ or not to employ, is a fundamental principle which should never be questioned or assailed. That upon it depends the security of our whole social fabric and business prosperity, and that employers or workmen should be equally interested in its defense and preservation.

While upholding this principle as an essential safeguard for all concerned, this association would appeal to employers in the building trades to recognize that there are many opportunities for good associations of workmen, and, while condemning and opposing improper action upon their part, they should aid and assist them in all just and honorable purposes. That, while upon fundamental principles it would be useless to confer or arbitrate, there are still many points upon which conferences and arbitrations are perfectly right and proper, and that upon such points it is a manifest duty to take advantage of the opportunities afforded by occasions to confer together, to the end that strikes, lockouts, and other disturbances may be prevented. When such conferences are entered into, care should be taken to state clearly in advance that this fundamental principle must be maintained, and that such conferences should only be competent to report results in the form of resolutions of recommendation to the individuals composing the various organizations participating, avoiding all forms of dictatorial authority.

2. That a uniform system of apprenticeship should be adopted by the various mechanical trades.

That manual training schools should be established as a part of the public school system, and that trade night schools should be organized by the various local trade organizations for the benefit and improvement of apprentices.

3. This association earnestly recommends all its affiliated associations to secure as soon as possible the adoption of a system of payment by the hour for all labor performed other than piece work or salary work, and to obtain the co-operation of associations of workmen in this just and equitable arrangement.

4. That all blank forms of contracts for building should be uniform throughout the United States.

That such forms of contract, with the conditions thereof, should be such as will give the builder as well as the owner the protection of his rights such as justice demands.

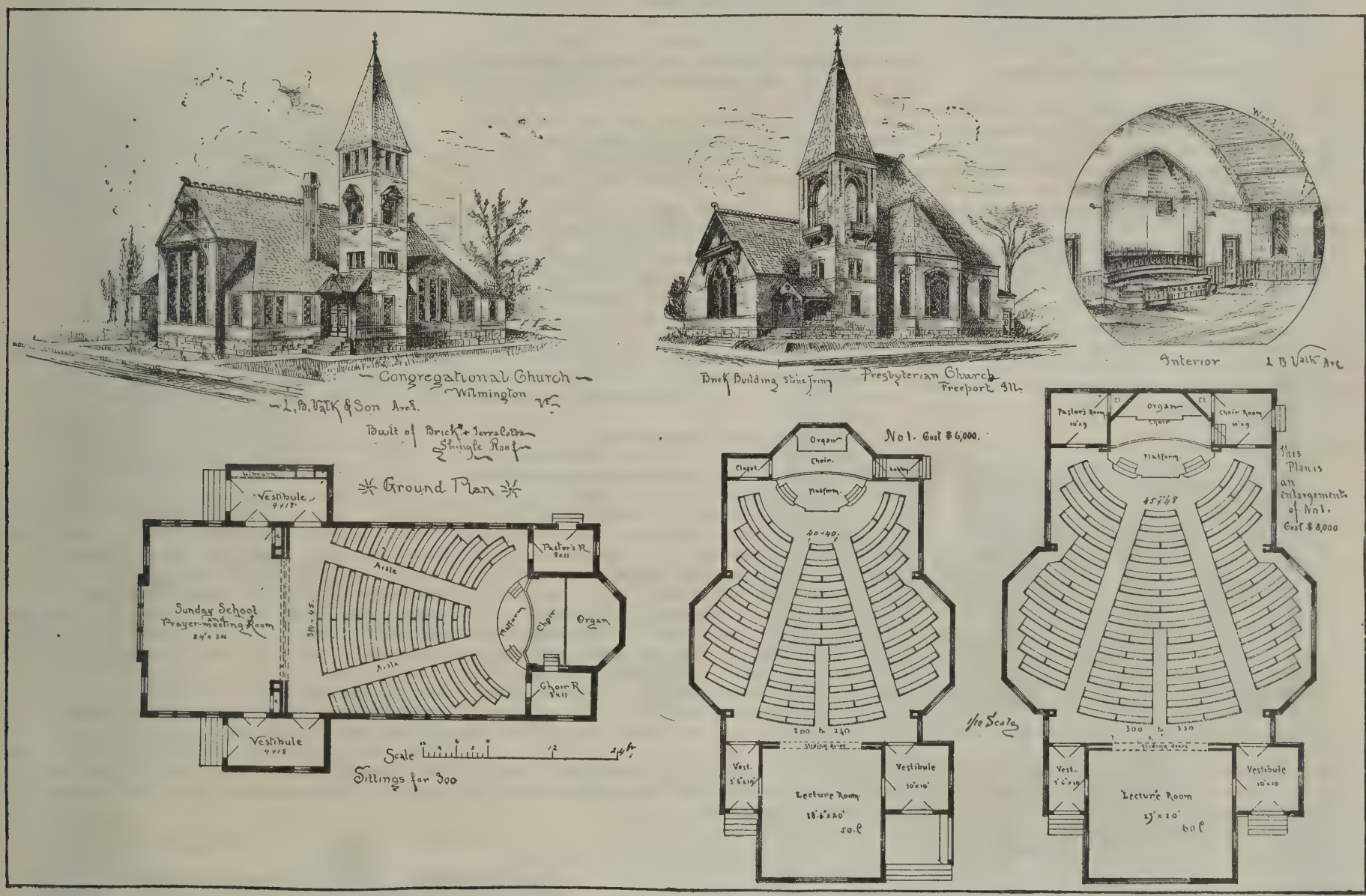
That whenever a proper form has been approved by this association, after consultation with the American Institute of Architects and the Western Association of Architects, we recommend its use by every builder and contractor.

5. The legislatures of the various States should be petitioned to formulate and adopt uniform lien laws, and every organization represented in this association is recommended to use its best endeavors to secure the passage of the same.

6. Architects and builders should be required to adopt more effectual safeguards in buildings in process of construction, so as to lessen the danger to workmen and others.

7. We recommend the adoption of a system of insurance against injury by accident to workmen in the employ of builders wherein the employer may participate in the payment of premiums for the benefit of his employes. Also in securing payment of annuities to workmen who may become permanently disabled through injuries received by accidents or the infirmities of old age.

The next convention is to be held in Cincinnati, on the first Tuesday in February, 1888. The officers for the present year are: President, J. Milton Blair, of Cincinnati; first vice-president, John S. Stevens, of Philadelphia; second vice-president, Edward E. Scribner, of St. Paul; secretary, W. H. Sayward, of Boston; treasurer, John J. Tucker, of New York.



CHURCHES OF MODERATE COST.

The Vast Sums of Money Expended by Builders.

At the recent Chicago convention of American builders, Vice-President Stevens said:

By an examination of the census of 1880, I found that there were in Philadelphia 146,412 dwellings, that they had an average of 5·79 persons to a dwelling. In New Orleans they had 36,347 dwellings, with a percentage of 5·95 persons to a dwelling; in Baltimore, 50,833 dwellings, a percentage of 6·54; in San Francisco, 34,110 dwellings, a percentage of 6·86; in St. Louis, 43,026, a percentage of 8·15; in Chicago, 61,069, a percentage of 8·24; in Boston, 43,944, a percentage of 8·26; in Brooklyn, 62,233, a percentage of 9·11; in Cincinnati, 28,017, a percentage of 9·11; in New York, 73,684, a percentage of 16·37. Now that is a matter of interest.

I then went to our building inspectors to ascertain what had been done in that line for the past six years. I found by an examination of our records that there had been 38,084 building operations, and of these 24,672 were dwellings, which, added to the previous number, makes a total at the first of the present year of 171,084 dwellings in Philadelphia.

I then inquired of our building inspectors as to the value of these building operations. I learned that each one of these comprised a single operation. A large store which we had built there, and which cost $300,000, was a single operation. Each of our churches, some of them costing $150,090 to $200,000, was a single operation. Some of our dwelling houses, costing $75,000 or $100,000, was a single operation. Our factories and our storehouses, ranging in cost from $25,000 to $100,000, were single operations, and so on, down to the humble home of the mechanic, costing possibly $1,000 to $1,200. They assured me that $6,000 for each operation would be a fair average. The figures startled me, and I said: "No; I cannot go away from here with a statement of that kind. I will put it $5,000. You are certainly far above the absolute facts."

Now, $5,000 for each one of those operations makes a sum of over $30,000,000 that is received and expended in a year by the mechanics of Philadelphia. Gentlemen, if we spend $30,000,000 in Philadelphia, what is spent in New York? What is spent in Boston? How much money is expended in Chicago? in San Francisco? in St. Paul? in New Orleans—all over this great country? Gentlemen, $750,000,000 would be a low estimate of the amount of money that is expended by the mechanics who are represented here in convention. Think of it! A sum of money that will exceed the amount which is expended in many of our commercial exchanges, in our boards of trade, among our merchants and our bankers, and we want the public to know it. We want them to respect us, and we want to respect ourselves. [Applause.] If these few words will make any of you go home from here feeling that you can lift yourselves up in your manhood, and feel that standing alongside of the professional man, or the storekeeper, or the merchant, you are part and parcel of the interests of this country, representing a business which exceeds in magnitude that which he represents, it will give you that much more self-respect, and you will receive respect from others in accordance with what you consider of yourselves. [Applause.]

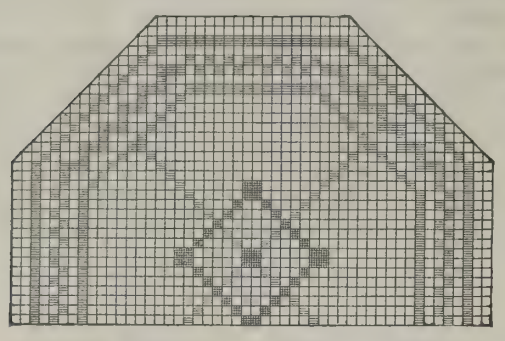
Earthen Drains.

I have never found one solitary case of an earthen drain that was properly laid. And Col. Waring states that in Memphis, where there has been every opportunity and every reason to lay the sewers as perfectly as possible, they found, when they were taken up, that the joints leaked.—*C. F. Wingate.*

END WOOD FLOORING.

Correct notions of health and improved taste have conspired in recent years to bring about a notable change in floor coverings in American houses. Almost without exception, dwellings of the better class now exhibit a sparing use of dusty carpets and a profusion of healthful and cleanly hard wood floors. This tendency has naturally incited invention, and within a decade many new varieties of wooden flooring have been introduced. Some were thick—parquetry; some were thin—wood carpet; but all or nearly all have held to the old method of laying, that is to say, with the side of the grain as the wearing surface.

A little over five years ago, a method of joining wood

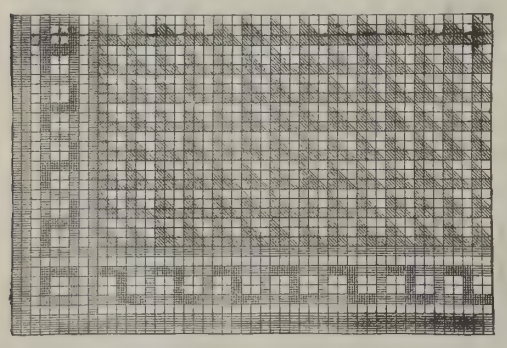


BAY WINDOW OR OCTAGON ROOM.

by molten metal was patented to an American inventor. The first and so far principal application of this method was in the construction of end wood flooring. This consists of pieces of various woods securely joined by metallic or wooden splines and *set on end* in such a manner that the end of the grain becomes the wearing surface.

In the application of joining by molten metal, the blocks of wood are first made as dry as possible, since the presence of even a small quantity of moisture causes the generation of steam when the hot lead is forced into the grooves. The blocks are then jointed to exact size, grooved, assembled into sections sixteen inches square, and showing any desired design by the necessary color selection, and finally joined into a solid section by the introduction of lead made fluid by the requisite temperature.

A more recent invention is a method of joining by

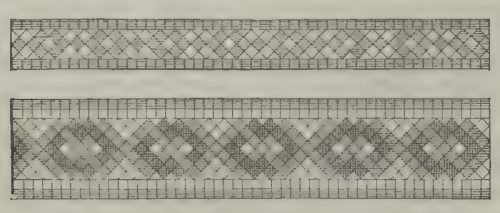


END WOOD FLOORING FOR RECTANGULAR ROOM.

wooden splines after the blocks have been subjected to the same process of drying, jointing, and grooving.

Of the extreme durability of end wood there can be no question. End wood floors in elevator cars subjected to constant wear for over three years still show no signs of loss in thickness, whereas side wood floors, under the same conditions, are found to wear through in a relatively short time. This statement is made on the authority of one of the largest manufacturers of elevators in the country, one who has over ninety end wood floors now in use.

Of the relative beauty of end wood and side wood there might naturally be doubt until the former had been seen. It is frankly admitted that certain pleasing effects are sacrificed by placing wood on end, just as in common quarter-sawed oak you lose one form of beauty and gain another, and with this the further advantage of greater durability and lessened danger



BORDERS IN END WOOD FLOORING.

from shrinkage and warping. So in end wood, unexpected beauties appear, which are no less in degree, though different in kind. Indeed, the beauties of end wood are so novel and so striking that even experts in woodwork marvel at the fact that these were never discovered before. Nearly all the hard woods in common use show beautiful variegations in color, bringing out in some the medullary rays which are otherwise rarely seen except in quartered oak, and exhibiting in all a richer, warmer tone than that shown by the same woods when the side of the grain is exposed.

But probably the greatest merit of all consists in the ease with which end wood floors are kept in order. There has certainly been considerable complaint by housekeepers about the difficulty of keeping hardwood floors in good condition. The fault doubtless lies, in many cases, in want of care and skill. In more cases, however, the complaints are well founded. Side wood floors, with even moderate wear, show such deep indentations from heel nails and furniture, that their original beauty is soon marred or wholly destroyed. End wood, on the other hand, will bear much rough usage, and still retain its perfection of surface, or be restored thereto with little labor.

The principles involved in the construction of end wood flooring, and especially in manufacturing it on a scale so extensive as to make it a practicable industry, were so novel and complex that its development has been slow. Gradually, and in the face of many opposing forces, it has grown into perfection and into public favor. There are now few States in the Union without samples of the work in actual use. Recently two floors were shipped to Greece for the new American school for classical studies in Athens.

This material is manufactured by Wood Mosaic Co., whose works are located on the N. Y. C. & H. R. R.R. in Rochester, N. Y. Their salesroom has now been for about two years at 321 Fifth Avenue, New York City. Here a large display of samples can be seen, and best of all, a floor subjected to hard usage and designed to give practical demonstration of the qualities which they claim for it.

We ought to add that the first cost of end wood mosaic hardly exceeds the cost of thick parquetry of the old style, hence its greater durability makes it in the long run more economical than any other.

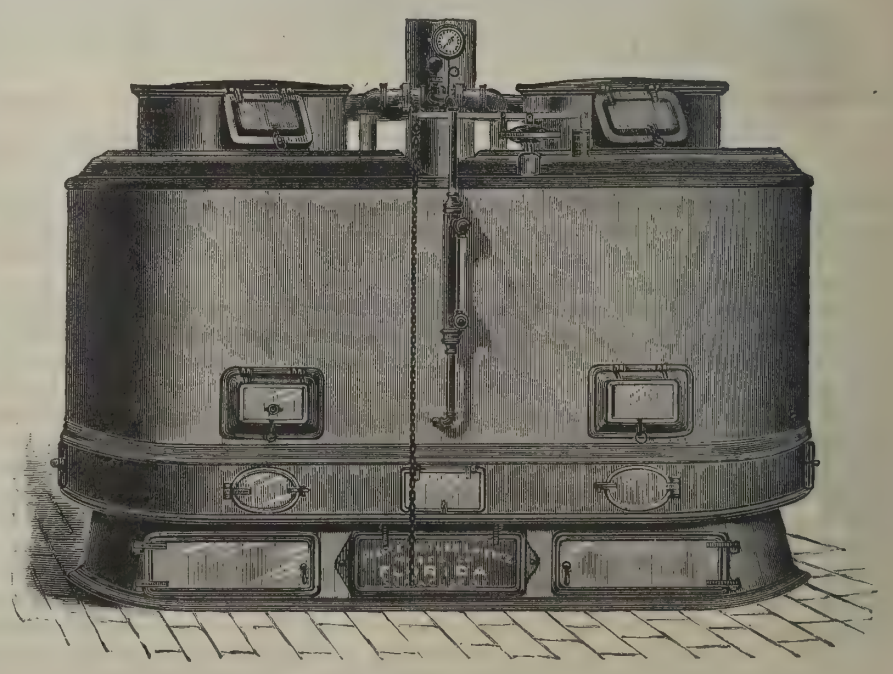
THE FLORIDA STEAM HEATER.

There are at the present time so many heaters of various kinds upon the market that the selection of the most serviceable and economical system often becomes a matter of no inconsiderable trouble and difficulty. A careful consideration of the advantages claimed for the Florida steam heater, made by the Pierce, Butler & Pierce Manufacturing Co., of 14, 16, and 18 Clinton Street, Syracuse, N. Y., is recommended before making a decision.

This firm manufactures these heaters in a variety of sizes, and for all purposes. The one illustrated in the engraving is of an extra large size, and is designed to meet the popular demand for an economical steam heater of sufficient capacity for warming public buildings, churches, schools, apartment houses, and other buildings of large extent. In it the parts are so arranged that two fire pots, two grates, and two self-feeding fuel magazines are operated, either separately or together, as may be required. In cold weather both fires are run, and in mild weather one fire is allowed to smoulder or entirely go out, with a corresponding reduction in the amount of heat generated and in the consumption of fuel. The great difficulty in large apparatus of reducing the heat without waste is thus accomplished in a very simple and satisfactory manner.

Small heaters for private residences and other purposes are manufactured, the characteristics of all the heaters being that they are not made of common cast iron, but of a carefully mixed composition of ores, which combines the maximum of durability with the quality of transmitting the heat in the greatest degree.

The construction of the Florida steam heater may be briefly stated to consist of three or more hollow cast iron water sections of circular form, with six oval shaped return flues, and three waterway openings cast in each. These openings in the sections, when set up, come in line and form the perpendicular return flues of the heater, as well as the steam communication between the sections. The construction has many other points of great advantage, to which we have not now space to refer.

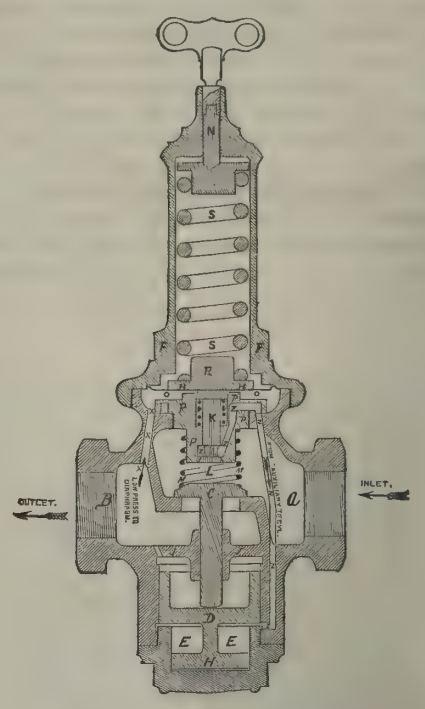


THE FLORIDA STEAM HEATER.

Among the advantages claimed for the heaters may be mentioned these: That it is cheaper, requiring no brickwork; it is sectional and easily handled; it is self-feeding or surface burning; it takes up less space in the cellar, being portable; it will carry steam in the coldest weather continuously from twelve to eighteen hours without attention; and last, but by no means least, it is the most economical of fuel of any heater extant.

THE MASON REDUCING VALVE.

In the many positions where it is desired to use a lower pressure than that of the boiler, such, for instance, as for steam heating coils, dry rooms, paper making machinery, etc., the Mason valve will prove of great service in automatically reducing and maintaining an even steam or air pressure, regardless of the initial pressure. They are made in various sizes, up to and including two inch, of the best composition, and above that size of cast iron, with composition lining. The construction of the valve will be sufficiently obvious on reference to the sectional view represented in the accompanying engraving. It will be seen that the



THE MASON REDUCING VALVE.

arrangement of parts is well calculated to do the work thoroughly and efficiently.

The Mason Regulator Co., of 22 Central Street, Boston, are the manufacturers.

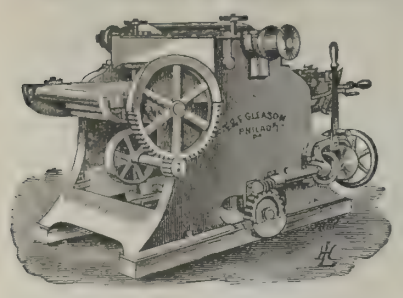
The N. Y. Central Iron Works.

The extensive manufactory of W. B. Dunning, at Geneva, N. Y., which is known as the New York Central Iron Works, is now turning out a large amount of material. Steam engines and boilers of all kinds, from 1 to 150 horse power, machinery, castings in iron and brass, and a very extensive set of steam heating boilers are among the manufactures turned out from this busy and thriving works. Of the number of these last is the patent portable base burning steam heating boiler, an excellent apparatus, having many advantages, which are of so decided a nature that it has been exported on order to England, Germany, Belgium, and even so far as Tokio, Japan.

The reputation of Mr. Dunning as a mechanic and manufacturer has grown during nearly half a century, and the excellent quality of his workmanship and materials is only equaled by the ingenuity of his many improved methods of construction.

To clean chamois leather, rub into it plenty of soft soap, and then lay it for two hours in a weak solution of soda and warm water. Afterward rub till quite clean, rinsing in clean warm water in which soda and yellow soap have been dissolved. Wring dry in a rough towel, pull out, and brush.

WOODWORKING MACHINERY.



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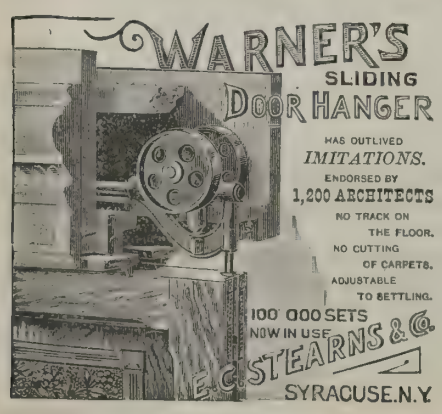

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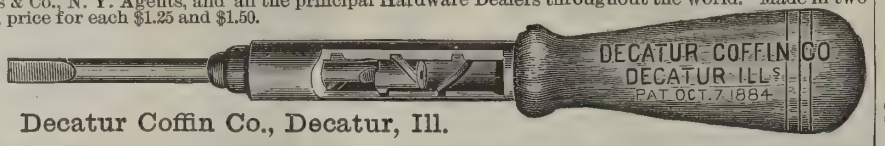

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Complete Outfits for Actual Workshop Business. Lathes for Wood of Metal. Circular Saws, Scroll Saws, Formers, Mortisers, Tenoners, etc., etc.

CONTRACTORS AND BUILDERS

who have no steam power can save themselves money and facilitate their business by using an outfit of Barnes' Hand and Foot Power Machinery. We have machines for ripping, cross-cutting, scroll-sawing, mortising and tenoning, forming edges, grooving, gaining, rabbeting, cutting dadoes, and turning.

Builders use our Hand Circular Rip Saw for the greater portion of their ripping in preference to carting their lumber to a mill within five minutes' drive from their shops. The same is true in regard to scroll sawing, mortising, tenoning, cutting stuff for drawers, boxes, etc.

Builders using these machines can bid lower and save more money from their contracts than by any other means.

Read the Following Letters from Builders:

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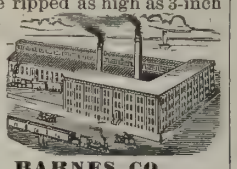

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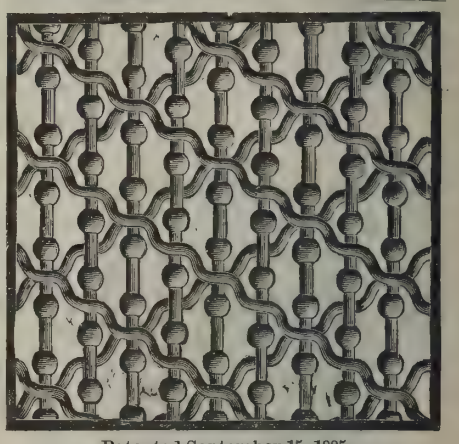

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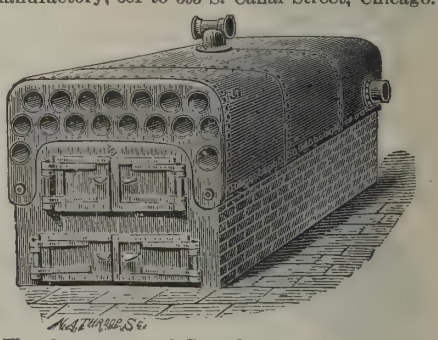

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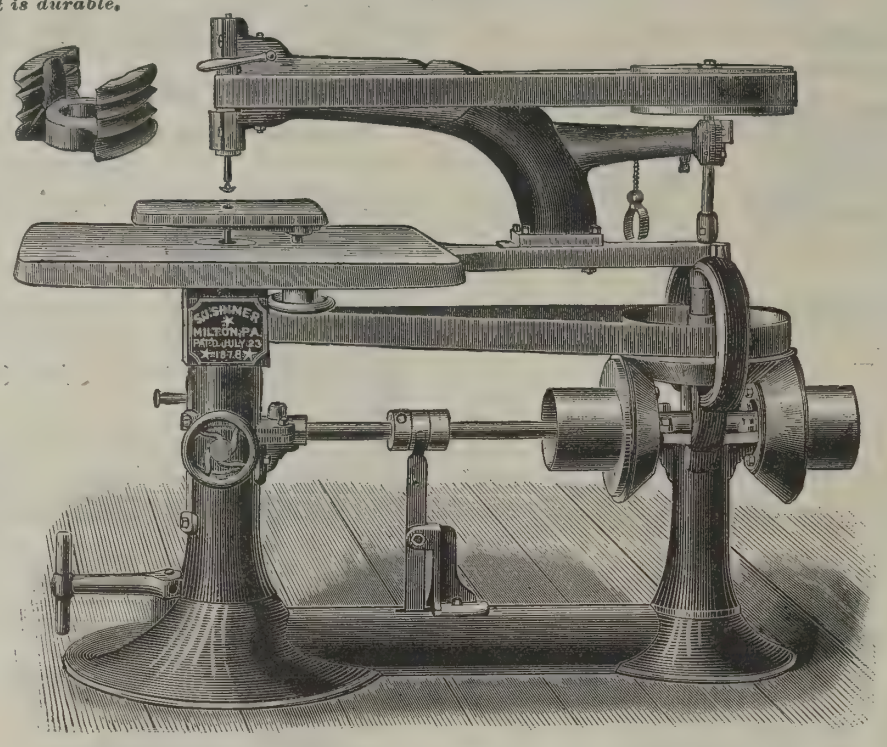

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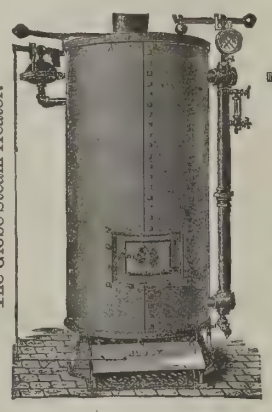

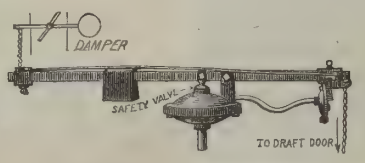

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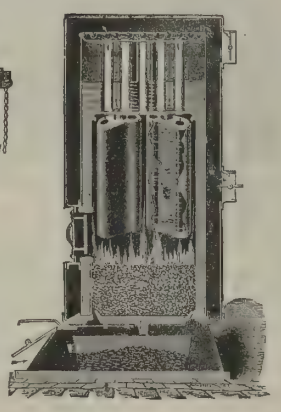

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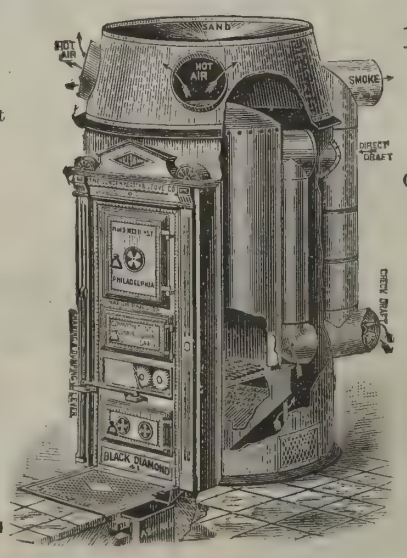

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(1) J. W. S. asks: Will you give me a receipt for a concrete walk made of gravel and cement, and inform me if such a walk will stand freezing or not, and how thick it should be? A. Remove the earth where the walk is to run to a depth of seven inches, and fill therein with loose sand to a depth of four inches. On this spread a thick mortar composed of best hydraulic cement one part, sharp clean sand three parts; the cement and sand to be thoroughly mixed. Take care to use but little water. A walk thus made will stand frost.

(2) J. B. E.—The safe load given in the calculation is for a 2 in. by 2 in. by ¼ in., instead of for a 2 in. by 2 in. by 3-16 in., as it reads. The error was made in using the area of 0·94 sq. in. for a quarter inch section. The area for a 3-16 in. section is 0·71 sq. in. The strength of the 3-16 in. beam is sufficient for a load of 198·3 lb., with a factor of safety of four.

(3) A. D. M. incloses the following slip from the New York *Sun:* Both horses pull equally on the corner, otherwise one horse would pull the other over on to the load; and both pull equally on the load, or the horses and load would move in a circle, and not forward in a straight line. Construct the two parallelograms of forces, and the resultants will balance each other, proving the truth of the above conclusions. He asks how to soften hard water in a cistern? A. In this case the water is rendered hard by the presence of lime water in solution. This could be gotten rid of by various chemicals, but we decline to recommend them, and should prefer to pump the water from the cistern and line the cistern throughout with a thin coating of neat cement, using no lime or sand.

(4) C. H. P., of Scitico, Conn., asks what is the best explosive to use under water in blasting a wheel pit? A. Probably rack-a-rock cartridges. They are inexplosive until dipped for a few seconds in a liquid which by itself is inexplosive. The latter is furnished separately. The immersion lasts but a few seconds, but after that the cartridges should stand for about 15 minutes to permit of a complete absorption of the liquid by the cartridge. Then they are ready for use at any time. They are to be fired in the same manner as dynamite. He also asks if Babbitt metal is injured by heating it red hot? A. Yes; it is. An old moulder would say the "nature would be burned out," meaning a destructive oxidation. Babbitt becomes crumbly and rotten if heated red hot and withdrawn from the fire to cool slowly. Part of its arsenic vola tilizes.

(5) C. J. W. asks: 1. Could I use railroad cinders instead of gravel in making concrete wall? A. Use Hart cement, 3 parts sharp sand, for concrete wall. No cinders. 2. Would it do to dig the excavation for building in side of hill, and put concrete wall against it? A. Yes. 3. Is it necessary to have stone foundation to start wall on? A. No. 4. How thick should wall be to make a good, warm stable? A. Sixteen inches. 5. Please identify mineral sent, and state what it indicates. A. The minerals sent are garnets. They have no value, owing to their poor quality, and do not indicate any valuable deposit.

(6) R. B. asks: Whose mortar colors are durable? We have had our attention called to the Pecora mortar colors, which they make in four colors—black, red, brown and buff. The black in particular is something hard to get—durable and free from acid. A. Made by Messrs. S. Bowen's Sons, of Philadelphia.

(7) W. H. G., of Matteawan, N. Y., desires to know how to find the subdivisions between 3 and 4, or the consecutive numbers, on a slide rule. A. For instance, on the slide B between the numbers 3 and 4 are ten divisions, and each division is one-tenth of the whole space or whatever value is assigned to 3 and 4. Thus, suppose 3 represented 30, 4 would then represent 40, the third space, beyond 3 toward 4, would represent 33, and the seventh space or index mark would represent 37. If, however, 3 and 4 are units, then each division must be read as a decimal. Thirty-three would then be three and three-tenths. Suppose it is desired to multiply 3 by 7·5. Against the 7·5 of A set the beginning of B, then over the 3 of B will be found the 22·5 on A. Division is just the reverse of this operation. The Stanley Rule and Level Co. publish a little book on the utility of the slide rule, which is a perfect exposition of the wonderful automatic calculations that can be performed by means of the rule. The book is sold at a moderate price.

(8) Some one asks if his problem of moments is correct. A. Yes; but the simplest method is by the graphical method. Lay off to any given scale the pull, AC, likewise the force, P, acting respectively at A, in directions AV and AB. Resolve the two forces, AC and AV, into their components, find their resultant. With this resultant combine the force, AB, and its resultant will be the resultant of all the forces. Its horizontal component will be the horizontal resultant component of all the forces, and similarly the vertical component. They can then be scaled off without calculation.

(*Continued on page* x.)

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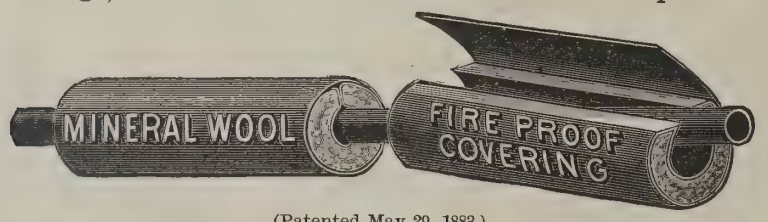

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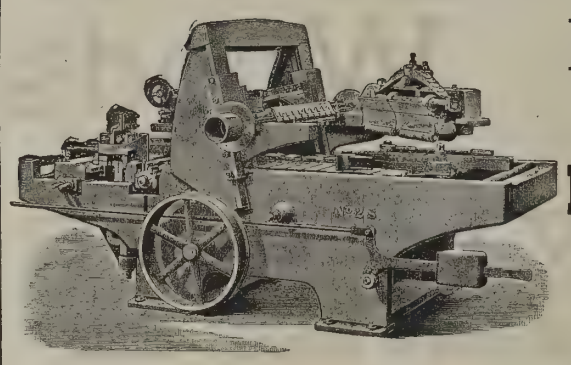

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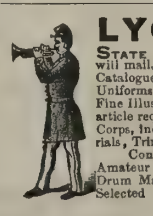

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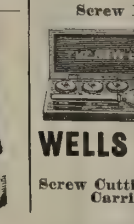

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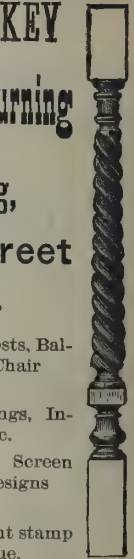

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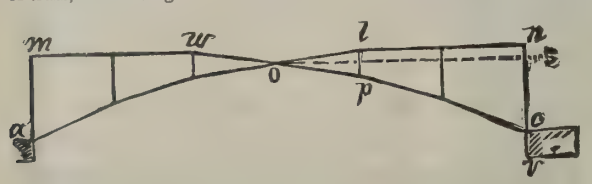
Notes and Queries.

(*Continued from page* vi.)

(9) C. C.—Plans for publication should present a perspective and floor plans, with a good general description of the building, cost, etc.

(10) In answer to B. P. L., of Ridgway, Elk County, Pa., who desires to know how to calculate the horizontal strains at the crown of braced arches, such as will be used in the proposed bridge across the Harlem river, at 181st street. A. I would use the following rule of Trautwine's for calculating the horizontal strain at the crown of a braced arch: Horizontal pressure at center, *o*, of the truss equals the weight of said half truss, and load in tons multiplied by the horizontal distance of said center of gravity from the nearest abutment, and the product divided by the vertical distance from *cs*, the abutment, *c*, to center, *o*, of truss, see drawing. 2. There are six sets of arches,



and the cross-sectional area of any pair of them is 14 ft. by 2 ft., for they are fourteen feet from center to center, and the distance between the upper and lower chord is two feet. The sectional area of the chords, the struts, and ties can be obtained from C. C. Schneider, N. Y. 3. Details of various iron or steel arch bridges have been published in *Engineering News* and *Railroad Gazette*, N. Y. 4. It would be difficult to name a book on iron or steel arches that is printed in plain, untechnical language. The nearest approach to it is Greene or De Volson Wood on arches.

(11) G. C. M.—A rough way of approximating the cost of an ordinary two story frame building would be to call it three dollars per superficial foot.

(12) R. & B., of Philadelphia, ask which is the best paint—No. 1, which will absorb or take up the most oil, or No. 2, that will take up the least oil? A. Generally speaking, the one which will absorb the most oil is best, but it depends upon the substances composing the paint body. No. 2 is the best paint, with a word of caution, but it would depend upon the character of the two paints. If No. 1 was a baryta paint, it would not absorb much oil, but it would be a better paint than No. 2, if the latter absorbed the most oil by reason of its being charged with silica, for the porosity of the latter would make the paint absorbent, but it would be a poor paint, because in time it would flake off, carrying the oil with it. The amount of oil which a paint body will carry and *retain* is what constitutes its value, and not what it may seem to carry and don't retain.

(13) E. W. B. says: Will you please answer this question: A building having a lightning rod, and the ground of the rod running into the ground and coming in contact with the water service pipe, what would be the result if the building should be struck by lightning? A. If the rod were of sufficient size and its lower end were well connected with the iron water pipe, say by soldered joint, the building would probably be protected from lightning. One of the best groundings or terminals for a lightning rod is a good connection with an iron water pipe under ground.

(14) A regular reader from Savannah inquires: Is there such a wood as white mahogany? If so, where does it grow? A. White mahogany grows and flourishes in the vicinity of Park City, Utah. It is from four to five inches in diameter, has a smooth bark and bushy top, and grows from twenty to twenty-five feet high. It is a creamy white wood, its grain is close, tight, and its surface exceedingly hard. It planes smooth and takes a high polish. It is fully as heavy as ironwood or dogwood. Some of it has been used for furniture purposes at Salt Lake City, but the principal demand for it is for wedges in splitting timber. It grows on high land. It does not split easier than red mahogany, but it is much harder. It has no appreciable value in Utah, as the cost of getting it out leaves but small margin for an investment.

(15) T. P. Y. asks: What kind and size of pipe is best to lay from a spring of ordinary soft water, 80 rods distance and 25 feet fall, for family and barn use? Will it be best to take a slight curve from a straight line to save a sag, or not? A. The size of pipe depends upon the quantity of water you may require and the capacity of the spring; 1 inch pipe will give a constant flow of 5 gallons per minute, 1¼ inch pipe 9 gallons per minute, 1½ inch pipe 15 gallons. A galvanized iron pipe is best. It will make no difference about the sag, except as every bend from the straight line increases the friction, and this would not be saved by laying the pipe in a circuitous line.

(16) O. K. L. asks: Can water 80–90° Fah. be forced by means of a hydraulic force pump under pressure 70–80 pounds into the pores of wood which has been cut across the grain in blocks a quarter of an inch thickness and put in an air tight copper or iron vessel? If so, how long a time would it take for the water to reach the center of the blocks of wood a quarter of an inch thick? Would exhausting the air from the vessel (and so in part from the wood blocks) before permitting the water to come in, facilitate the penetration of water subsequently forced under hydraulic pressure, as before described? A. Water should penetrate the blocks of wood, under the circumstances mentioned, in a few minutes. The air in the wood would be compressed to about one-fifth its volume, and would be absorbed by the water, which might take several hours. If the compression is only for a few minutes, it is possible that the air, not being absorbed, would drive out part of the water by its expansion. Exhausting the air at first would insure the immediate penetration of the water under pressure. Fill the vessel with steam, and allow it to condense; this will probably produce sufficient vacuum.

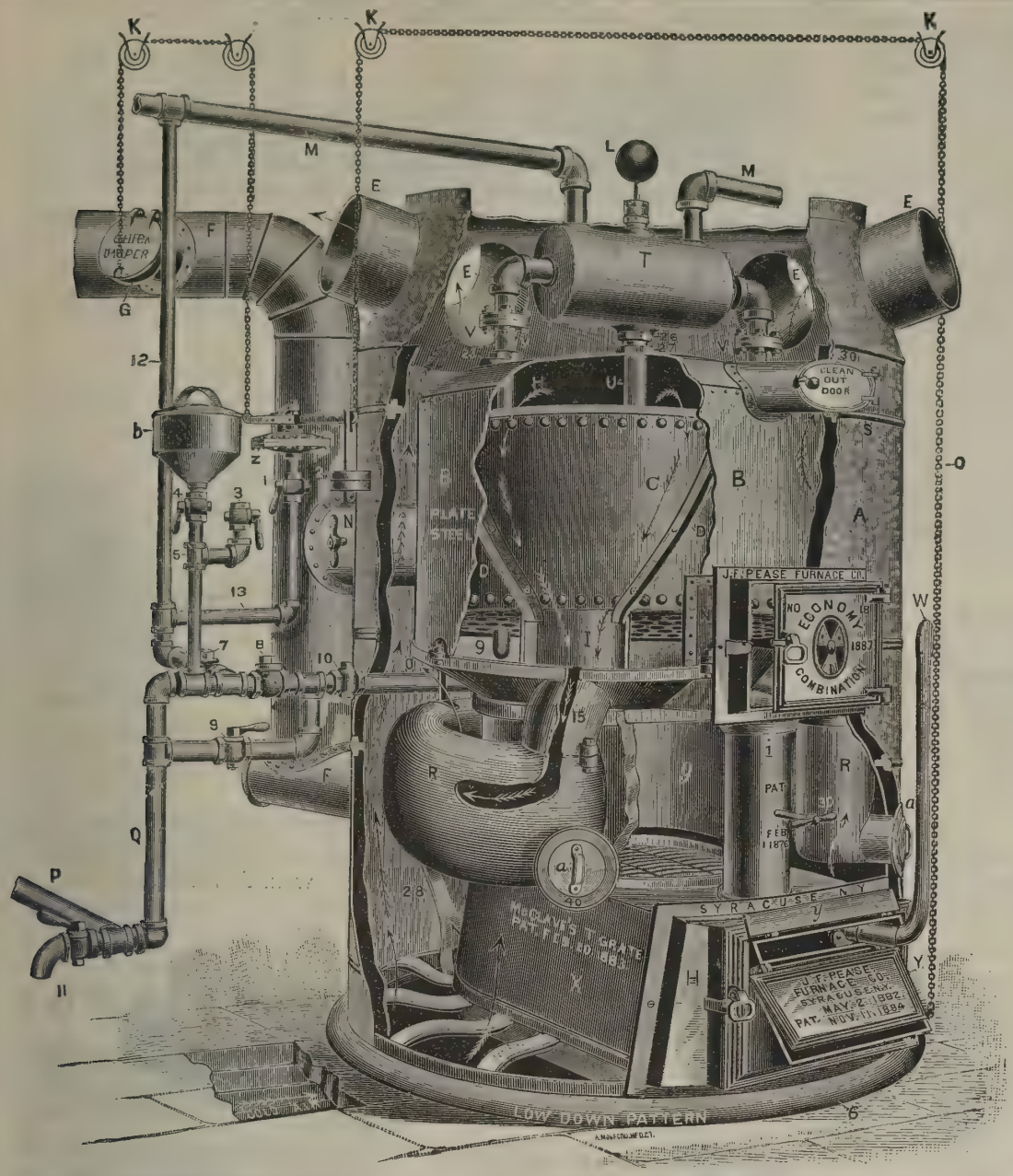
(17) R. H. asks (1) whether there is a firm manufacturing paper pipe of the same material used in making car wheels. Iron pipe rusts so rapidly in our damp, sandy soil that we thought pipe made of paper would answer better. A. We understand that paper pipe, made by rolling thick paper asphalted upon mandrels and cementing by heating, has been made and used in France. We do not know of its being made or in use in the United States. Galvanized iron pipe is now used generally underground except for the larger sizes, in which cast iron is preferred; both are durable. 2. Would also like your opinion as to whether or not water can be drawn through a 3 inch pipe a distance of 3,000 feet with gradual elevation of 25 or 27 feet with steam pump. Our factory is about that distance from a lake and about that height above the level of it, and we would like to know if we can draw our supply of water from the lake, as our wells are almost dry. A. Yes; but you will have some trouble in getting the water started in so long suction.

(18) J. B. asks (1) a receipt for a No. 1 harness polish. A. Alcohol 1 gallon, white turpentine 1½ pounds, gum shellac 1½ pounds, Venice turpentine 1 gill. Let them stand by the stove till the gum is dissolved, then add sweet oil 1 gill, and color as you wish with lampblack. 2. A receipt for a whitewash that will not crack or peel off the walls of the engine house or brick. A. The following receipt for whitewashing, sent out by the Lighthouse Board of the Treasury Department, has been found, by experience, to answer on wood, brick, and stone nearly as well as oil paint, and is much cheaper. Slake ½ bushel lime with boiling water, keeping it covered during the process. Strain it, and add a peck of salt dissolved in warm water, 3 pounds ground rice put in boiling water and boiled to a thin paste, ½ pound powdered Spanish whiting, and a pound of clear glue dissolved in warm water; mix them well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible with painter's or whitewash brushes. 3. Is there any difference in the time at which different electric alarms go off, for the same alarm on one circuit? We have two circuits connected with a four circuit repeater; we have left the question to you to decide. A. Practically the gongs all strike at once; but theoretically there is a difference, that gong which is furthest off striking last. The difference in time cannot be measured, it is so infinitely small.

(19) L. S. asks for a formula for a stain, and method of applying same, that will make a good imitation of red cedar, on elm or other light colored woods. A. Either of the following will probably answer: 1. Boil ½ pound madder and ¼ pound fustic in 1 gallon water; brush over the work, when boiling hot, until properly stained. 2. The surface of the wood being quite smooth, brush over with a weak solution of aquafortis, ½ ounce to the pint, then finish with the following: Put 4½ ounces dragon's blood and 1 ounce soda, both well bruised, to 3 pints spirits of wine, let it stand in a warm place, shake frequently, strain, and la on with a soft brush, repeating until of proper color; polish with linseed oil or varnish.

(20) H. P. T. asks: What is the cause of and remedy for discoloration of slate roof? The roof is something on the French style, topped out with a tin roof. Can it be rust or the paint used in painting the tin? It gives the slate an extremely bad appearance. Thinking it was iron rust, as the roof had been previously neglected, I tried acetic acid, etc., on the slate, but it had no apparent effect on it. A. Try oxalic acid 1 part, crystallized water 6 parts, by weight. Wash the slate with a swab and the acid, then wash with clean water. Oxalic acid is poison, and a powerful eradicator of stains.

(21) J. M. E. asks directions for making a good varnish for paint that will stand the weather for doors, or if there is such a varnish. A. To make a good varnish is a trade in itself. Purchase a wearing body varnish, the make of any well known manufacturer.



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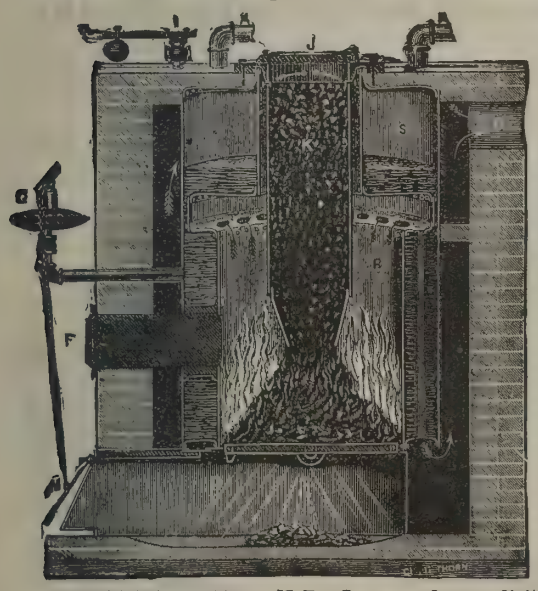

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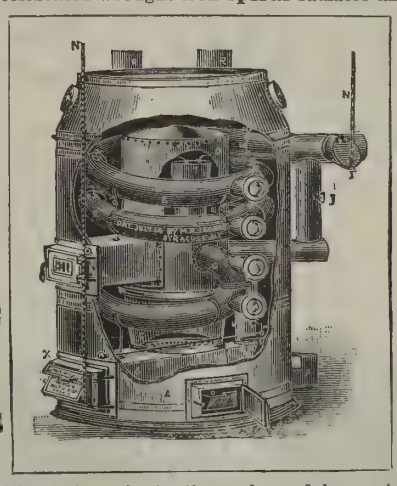

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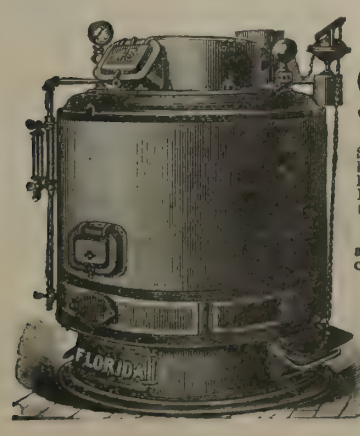

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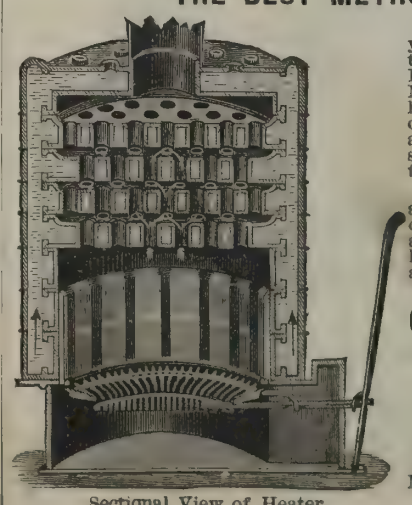

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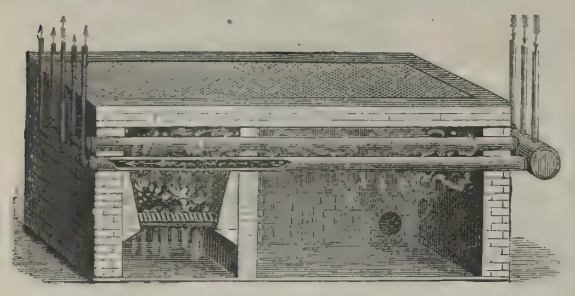

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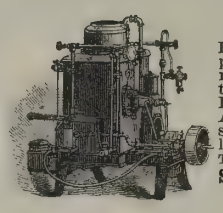

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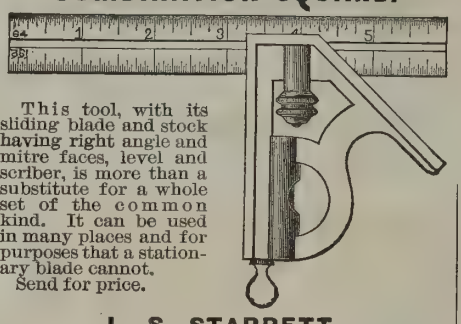

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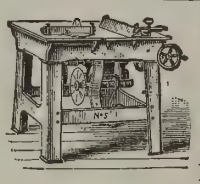

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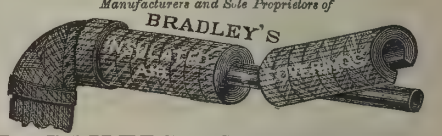

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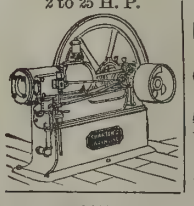

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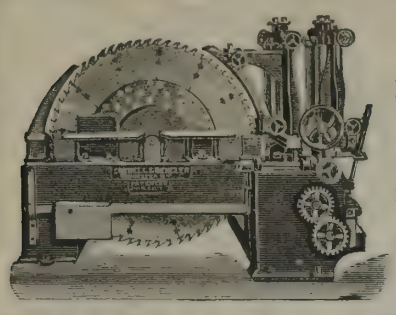

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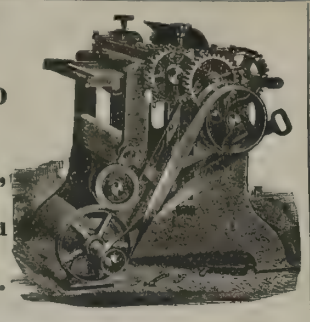

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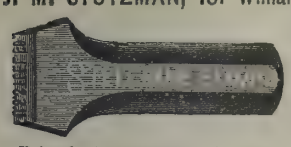

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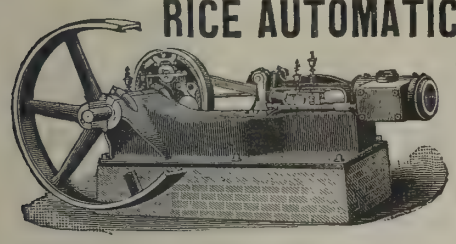

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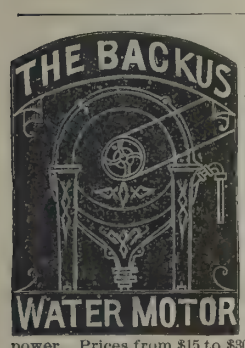

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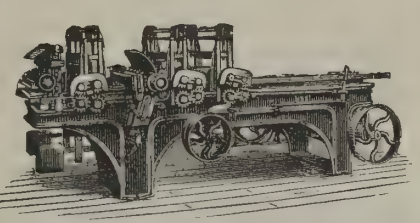

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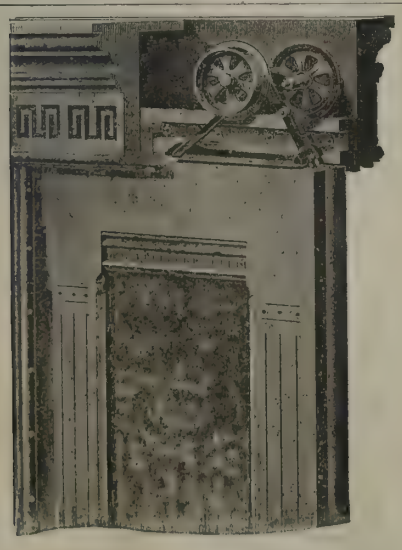

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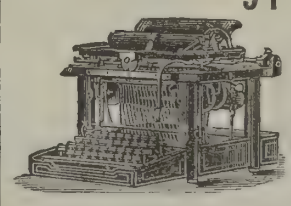

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MUNN & CO., Editors and Proprietors,

No. 361 BROADWAY, NEW YORK.

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CREOSOTE WOOD PRESERVING STAINS.

Wonderful has been the artistic improvement in wooden exteriors of the last lustrum, indeed of the past ten years. We have only to look back at the houses of the last generation, with their dreary lines of clapboards covered with a monotonous veneer of thick paint, to rejoice at the changes that have occurred. Is it not perhaps a process of evolution, this abandonment of the clapboard for the shingle?

May it not be compared to the change from the rectilinear exactness of the reptile's scale to the varied and exquisite beauty of the feathers of birds?

This analogy becomes still more suggestive when we observe the beautiful results that the introduction of stains in the place of paint has accomplished. Most artistic effects have been obtained by mixing shingles stained in different tones, thus giving the soft and deli cate shading seen in the plumage of birds.

A word of warning may not be here amiss in regard to stains.

First.—They should not contain benzine, as some of the imitations of creosote stain have lately done.

Second.—They should not be made by mixing dry color, English or otherwise, with linseed oil, as some others have been. Such a stain may be known by the rapidity of its settling on standing, and by having only a smell of linseed oil. Such a material is not a stain, but merely a thin paint, lying wholly on the surface and masking, rather than enhancing, the beauty of the grain.

The creosote stains are the result of many years of experience, and are the only *true* stains made for exterior work.

In color and intensity they vie with the best paints, while their effect is much more artistic and transparent. The preserving properties of these stains are perfectly understood, but not until lately was it generally acknowledged that creosote diminishes the risk of fire, while also toughening the fiber of the wood.

ARCHITECTURAL EDUCATION.

Among the many inquiries upon this topic we find upon our table one from a young man of Pittsburg, Pa., to the following effect:

"I am twenty-six years old, and would like to study architecture. I have worked two years at outside carpenter work, and am now entering my second year on inside finish, in which position I hope to remain for two years more, and during this time I desire to study such matters as will thoroughly prepare me for architectural work. I have done considerable designing, can make the working drawings, and do perspective work. Now, will you be kind enough to please inform me through your columns the proper books to study, naming them in the order in which I should study? Am now studying algebra and geometry.

"2d. Is it possible for one who has always been fond of study, and who has a general knowledge of the practical part of the business, to become an architect without professional assistance, or would it be necessary to enter an office? Is there any law to govern this?"

Here is a young man who has had some practical acquaintance with the constructive branch of architectural art. The mechanical drudgery of his work has not daunted his spirit, nor quelled the artistic instinct within him, and the query is fairly presented, How shall he gain knowledge of the coveted art? Shall we turn him over to the course recommended by our esteemed contemporary, the *Sanitary Engineer*, who says, first he must take a regular course at one of the architectural schools, four years, then the routine of a year's office work as draughtsman, then one or two years in one of the ateliers of the Ecole des Beaux Arts, Paris, and, finally, the usual round of travel and observation throughout Europe—a very good course, we will admit, for a young man who can afford to spend nine years of his life in getting ready to begin, but what of the young man who has not the nine years and the nine thousand dollars to devote to its acquirement?

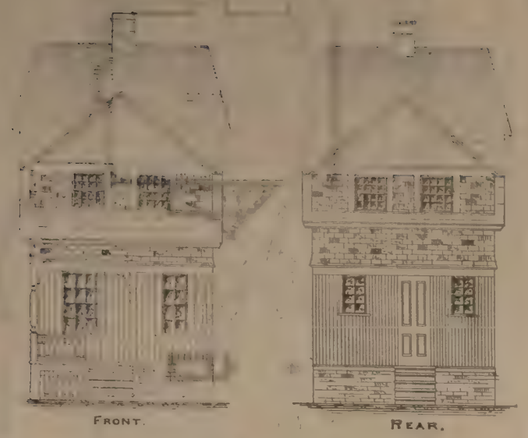
Would we have had a Christopher Wren, had he been obliged to take such a course? And is it the course that makes the artist, or the man? With all due respect to the Ecole des Beaux Arts, believing it to be the best art school in Europe, and while admiring the spirit of its work, yet we must protest against its methods as being the best adapted to the future needs of our architectural students. Its efforts to galvanize the corpse of the Renaissance can be of little value to the wants of our own country. As Owen Jones well says, in France drawing schools exist in every town, where the young may obtain much elementary knowledge, and there are in Paris many studios where professors devote their time to the instruction of a large number of pupils, making them thoroughly acquainted with the works of every period, and giving them a thorough knowledge both of architecture as a fine art and of construction in theory. The difficulty with our lack of progress in architectural art lies not so much with architects as with the public, and it is our people, as a people, who need to be architecturally educated. The beginning of such an education lies naturally in our public schools, and the various schools of design now under full headway are doing encouraging work in many of the large cities of the country.

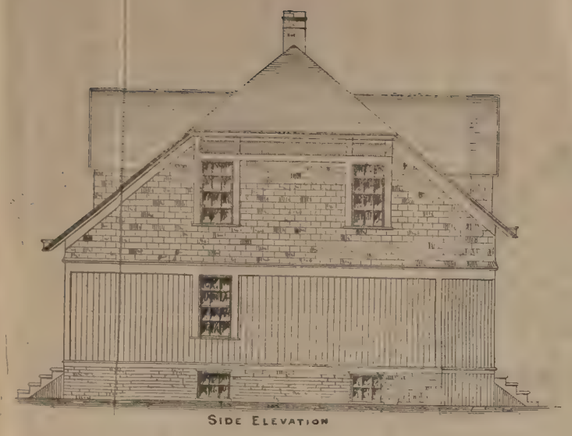
Again, we must take exception to the remark of our contemporary that "an exhaustive technical, or, rather, engineering, education is apt to be a hinderance rather than a help. Aside from a certain limited amount of calculation, the engineering ability involved in the construction of even the heaviest buildings is a matter of experience and judgment rather than of abstract learning"—a doctrine which implies that skill in fine art means deficiency in practical matters of construction, and which we believe is pernicious to the highest degree.

For example, how easy it would be to a man who was simply a colorist, a decorator, or a designer, but deficient in the technical art of stone cutting, to have designed the beautiful marble stairway in the *foyer* of the Equitable building, and to have determined the proper size of its voussoir steps, and the thrust of its low segmental arch, and the proper thickness of the wall to sustain its thrust, and, on the other hand, how absurdly difficult it would be for the technically educated engineer-architect to have designed such a beautiful structure! Forsooth, what does an engineer know about Mexican onyx balusters or endolithic marbles?

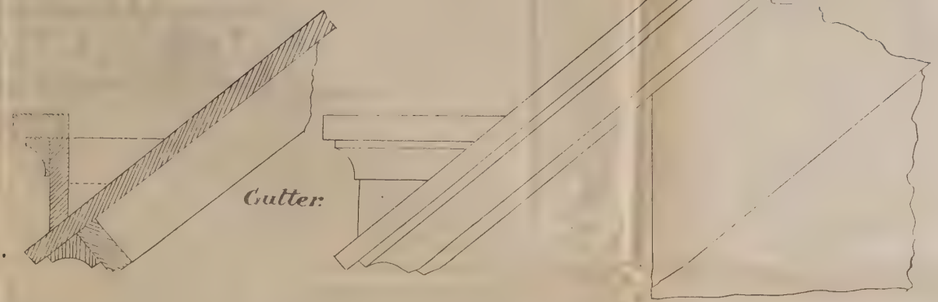
One of the most prominent architects in this city, a graduate of the Ecole des Beaux Arts, is of the opinion that the technically educated mechanical or civil engineer, with an ardent love for architectural art, has received the best preparation possible as an introductory to his architectural studies and future career. Safe building construction is not second to artistic creation, and the man who can accomplish the latter without the former is not entitled to the name of architect. To design the former necessitates the technical knowledge, training, and thinking of the engineer. To attain the latter, simply a knowledge of the artistic work of all ages, with the spirit and instinct of an artist within him. On the other hand, it is equally true that a man deficient in the faculty of æsthetic expression can never attain an enviable height as an architect. He must have within his own breast an inherent love of the fine arts, but all the schools in the world, not even the Ecole des Beaux Arts, can make an artist-architect of a man who is not endowed with a keen sense of harmony of proportion, color, and expression before he goes there. Architecture is nothing if not an expression of individualism. True it is, traditions, precedents, and the art expression of all the ages come down to the individual, and it is the impression of them all upon himself that is worked out in that individualism. It is, finally, an ideal creation manifested through the image of one mind, consonant with the instinct of one soul, harmonious, beautiful, not the confused, distorted, inharmonious conception of many minds acting together in patchwork order, not that monster of modern times "administrative" architecture.

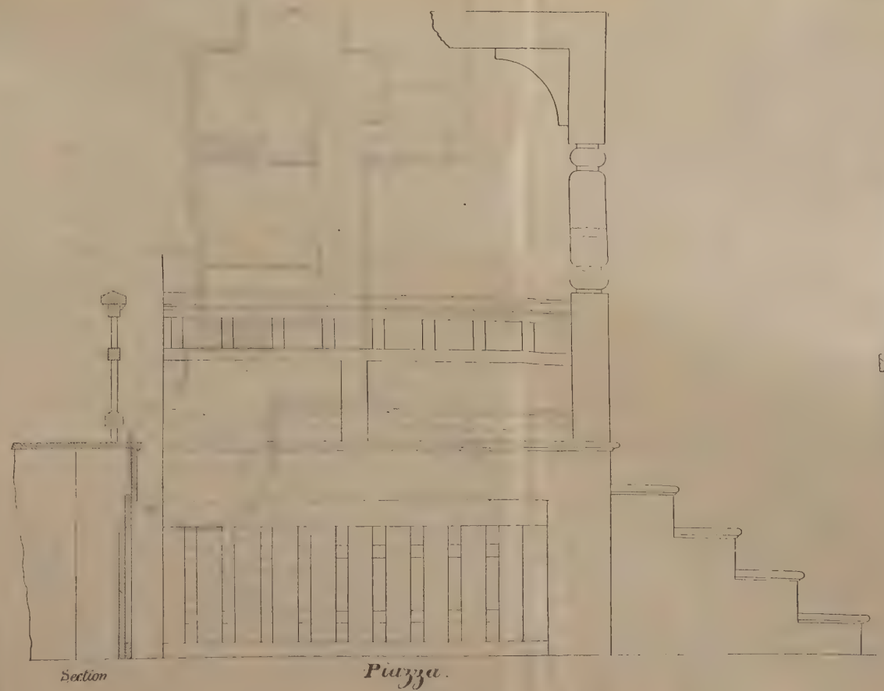
Before us lies the memorial resolution of the American Institute of Architects, adopted in honor of the late Mr. Ferguson, than which no brighter name adorns the page of architectural fame of the nineteenth century, and, in the words of that resolution, "his 'History of Architecture' forms the highest authority on the subject for English-speaking architectural students and connoisseurs," and yet "a most notable fact in connection with Mr. Ferguson's long and highly honorable career is that he was not educated to architecture, either as a practitioner or an amateur, but to mercantile pursuits, and that he voluntarily gave up fine prospects in this direction for the sake of devoting himself to the disinterested study of architecture and to the literary elaboration of the history of its forms." But if the architectural student has carefully read the statement that he must take a nine years' course of study before he can accomplish anything, and yet

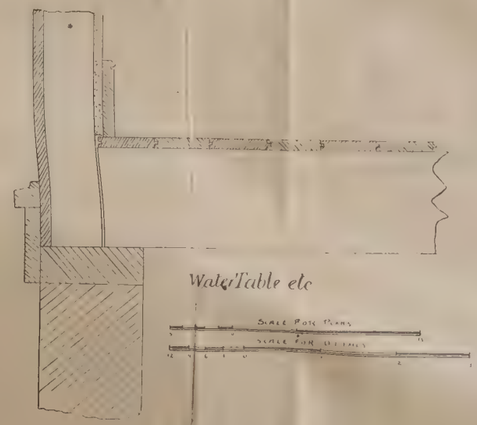


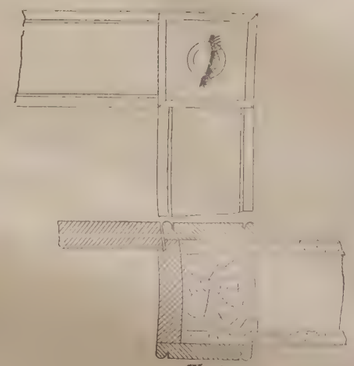


Plans, Elevations, and Detail Drawings of a $1,200 Residence.









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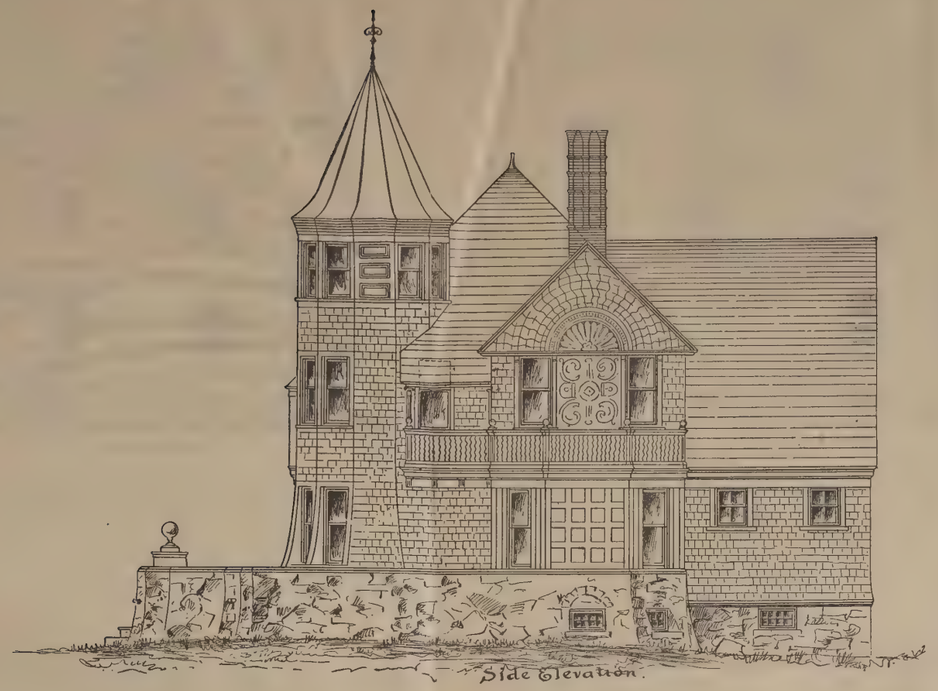
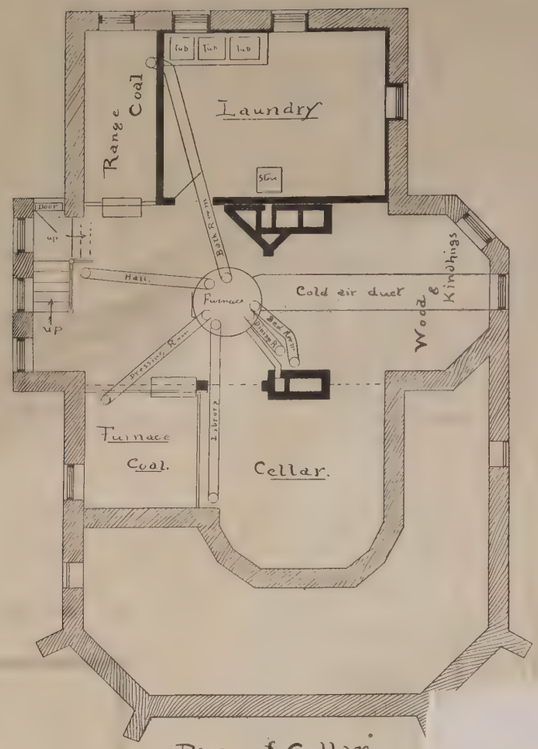
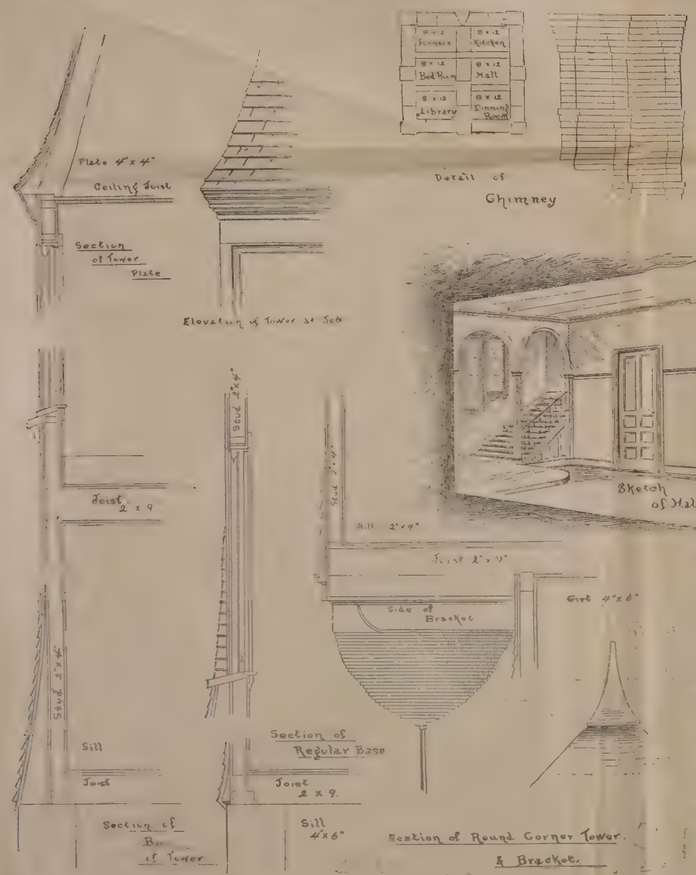
Front Elevation



Side Elevation.

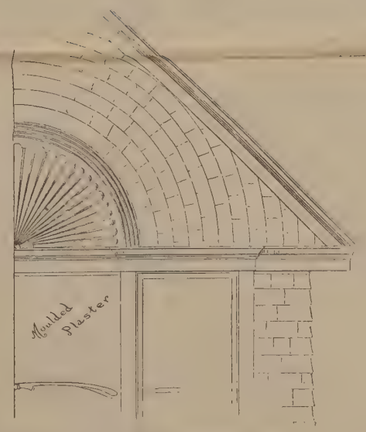


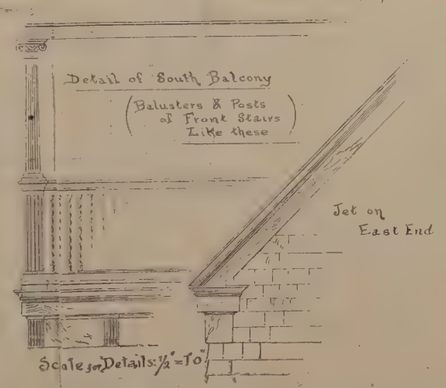
Plan of Cellar.

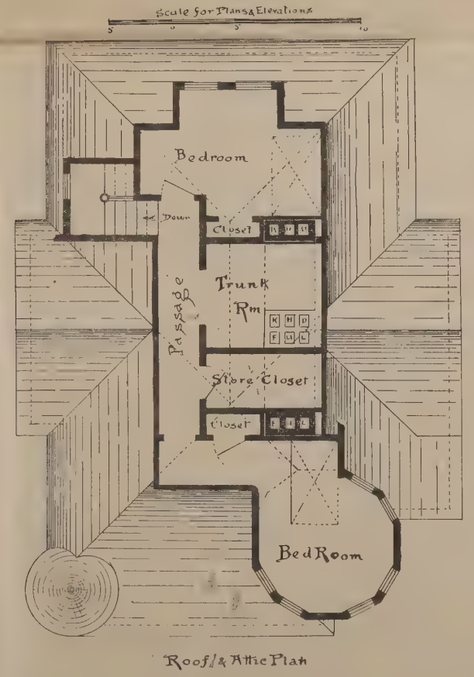


Detail of Chimney

Sketch of Hall







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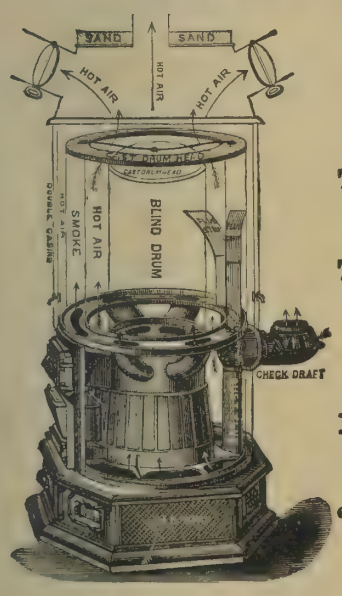

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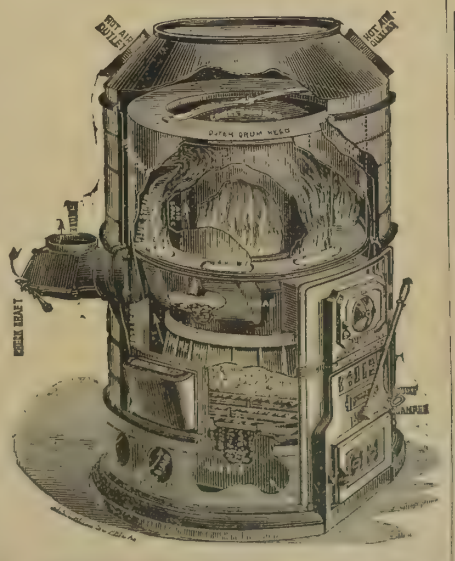

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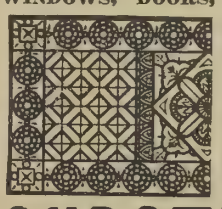

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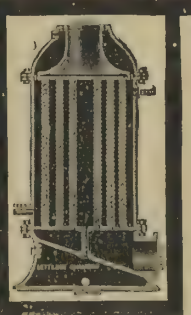

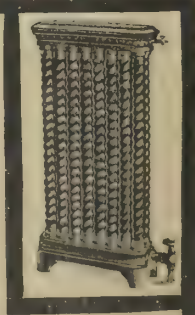

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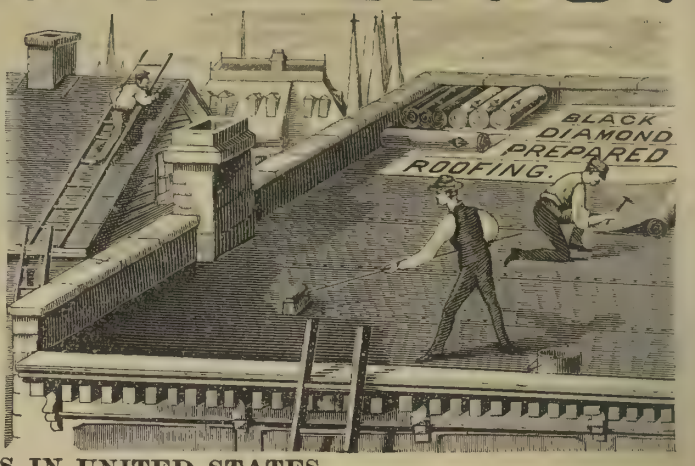

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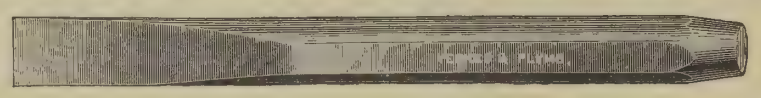

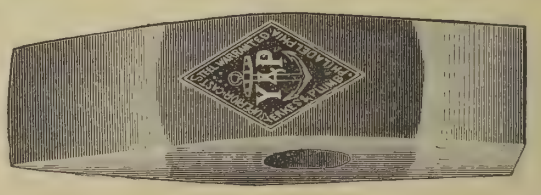

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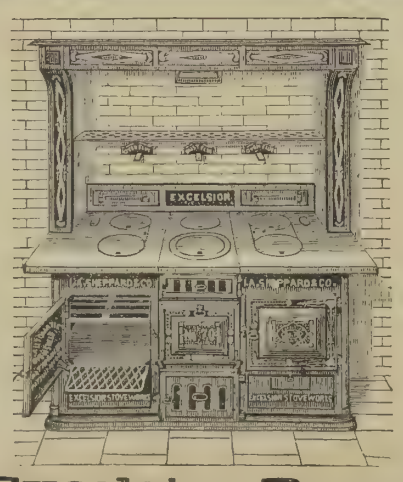

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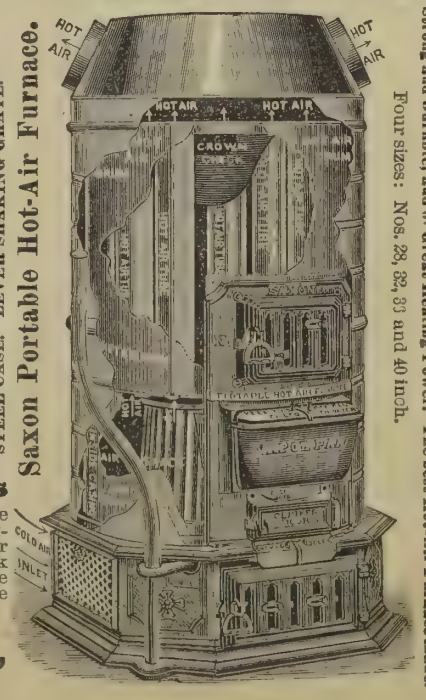

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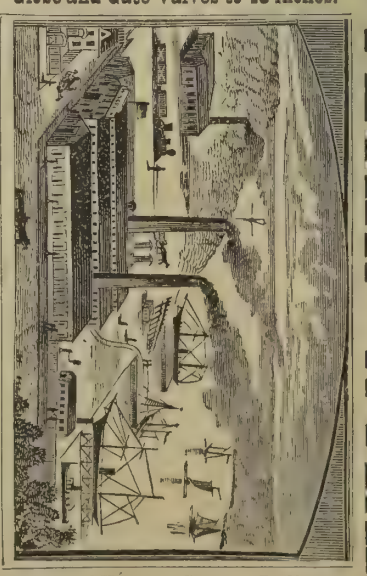

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